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ELECTRICAL WORLD

JULY 25, 1931
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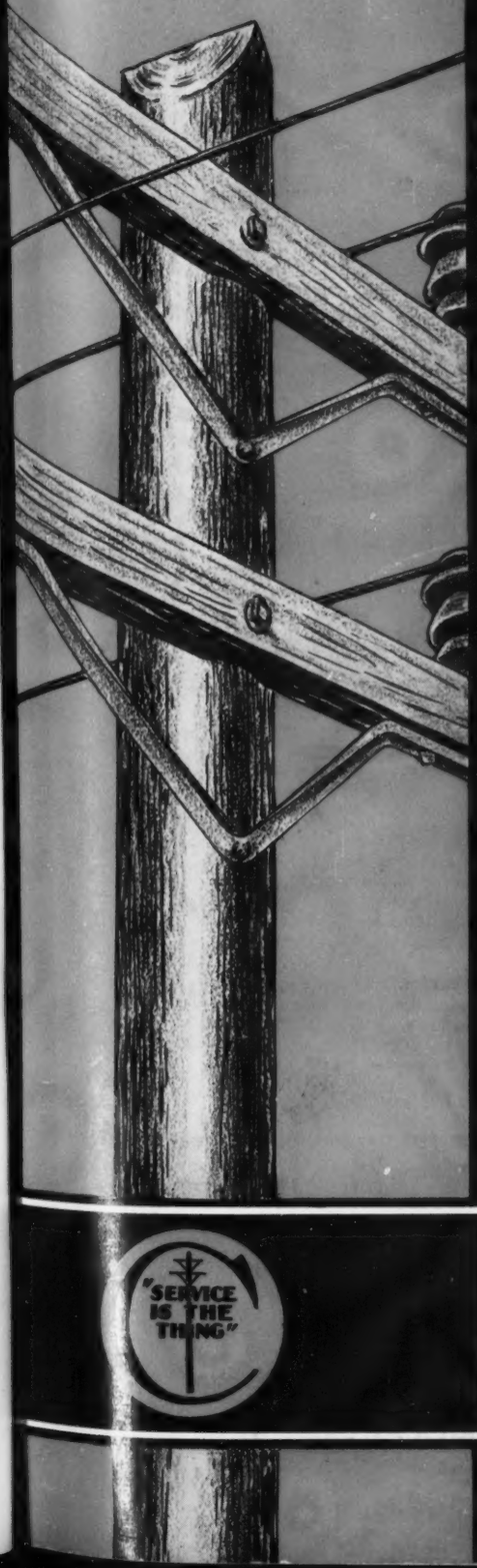

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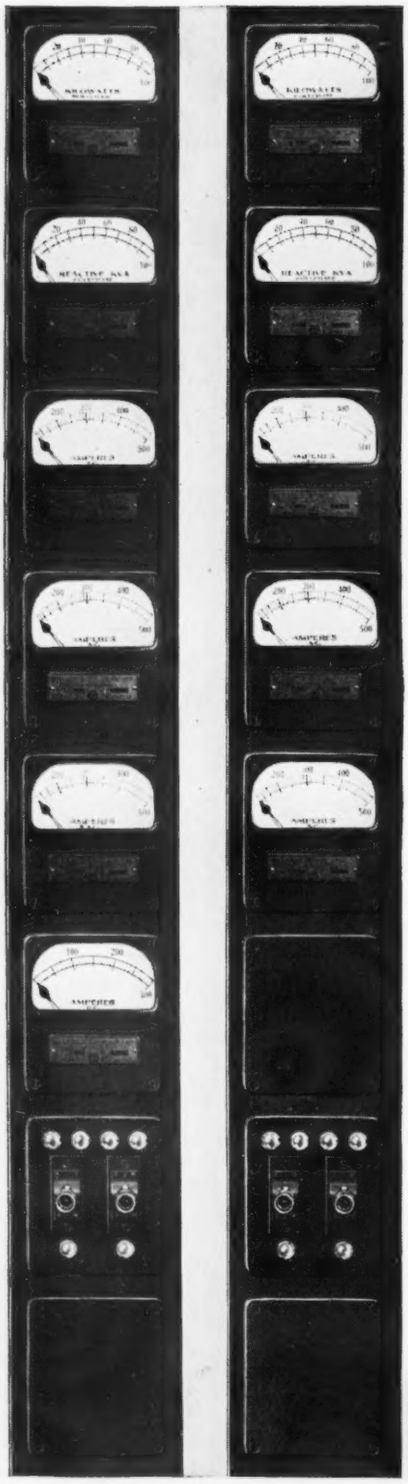

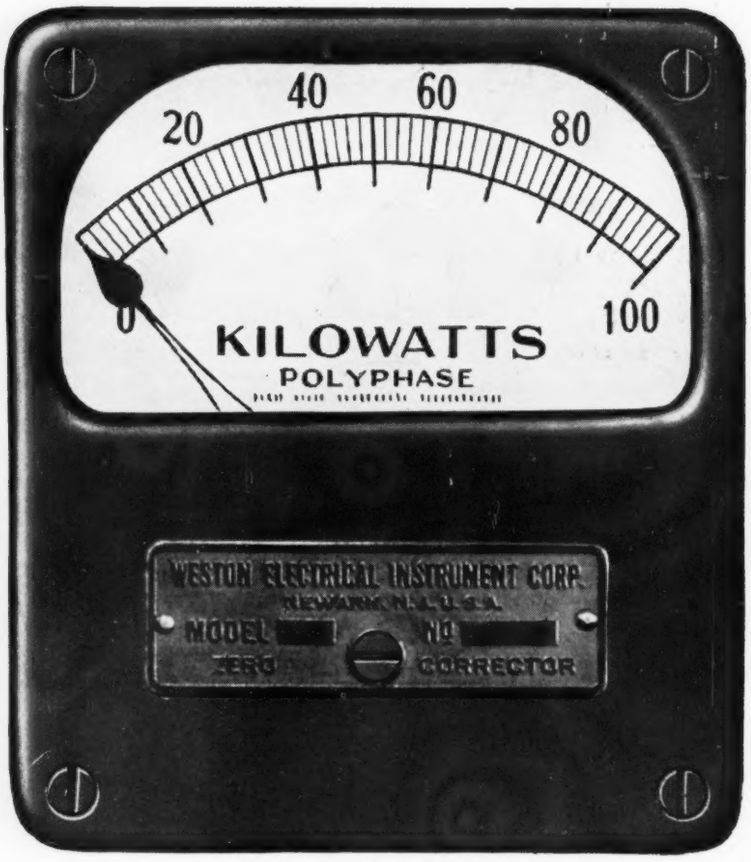

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A consolidation of Electrical World, Electrical Engineer and American Electrician

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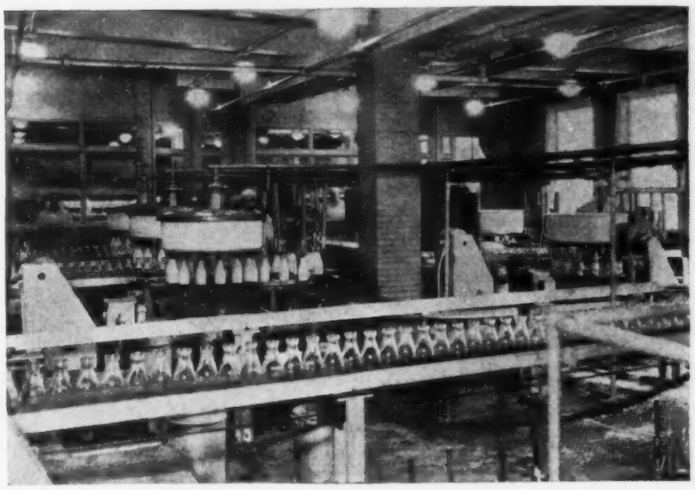

Electrified dairy, Pittsburgh, Pa.

JULY 25, 1931

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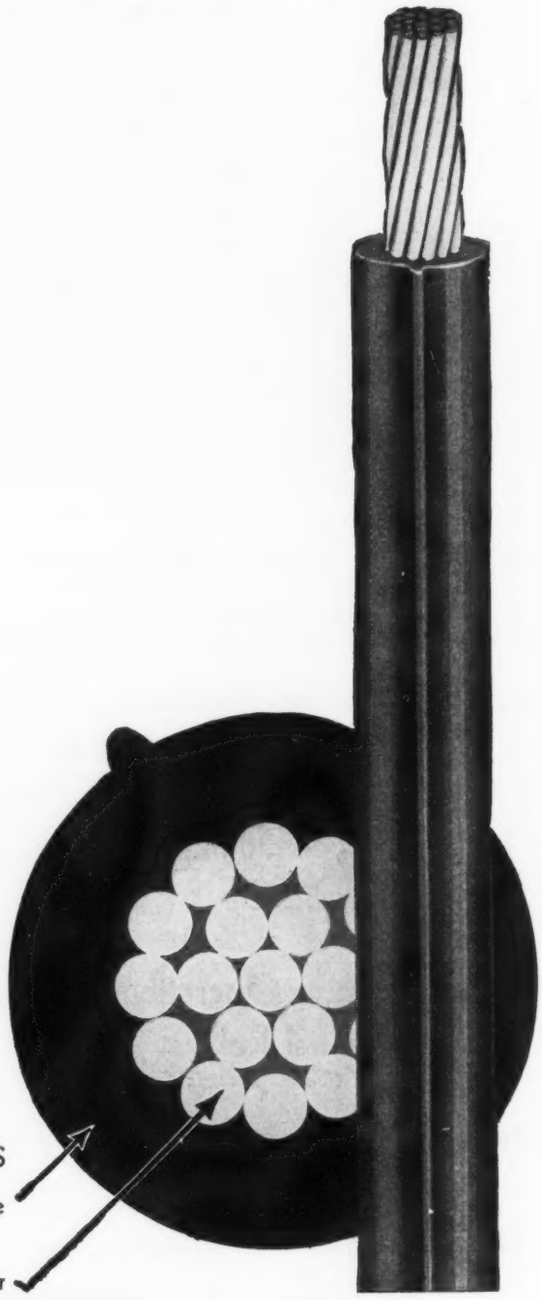

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ELECTRICAL WORLD

for the Week Ending

July 25, 1931

Canadian House unearths some power skeletons

—**Beauharnois scandal spreads,** involving company contributions to several political parties, easy money for promoters and a Canadian Senator who, though chairman of the board, claimed "parliamentary immunity"—*p. 134.*

—**Steel-mill tonnage increased** by introduction of twin-motor roll drives. Higher average rolling speed and shortening of intervals between passes are the principal advantages realized over single-motor drive—*p. 164.*

There are errors in scientific conclusions now, just as there have been in the past. Hardly a single scientific fact of one century remains adequate for the next. First the world is flat and the sun rises; then the world is round and the world goes around the sun. Then the whole system moves through infinite space toward Alpha Centauri, and then the space loses its infinite quality and adds a curvature. I don't expect to see the end of changes, nor will any one else, because the last man will insist on making them while he improves.

W. R. WHITNEY,
Director of Research
General Electric Company

Buffalo chose radial primary feed

—**Radial distribution desirable** for Buffalo's 100,000-kw. system, was conclusion of company engineers. So that was used instead of network. Substation standardization brought economies—*p. 144.*

—**$100,000,000 Indiana merger** now under consideration meets no opposition at commission hearing and is notable in that it envolves no "write-ups." Decision is due shortly—*p. 138.*

Commission rule for billing methods?

—**New York seeks uniform bills** for electric utility customers. Public Service Commission encounters opposition to clarification plan and gives companies time to organize their protests—*p. 135.*

—**Thermionic voltage regulator** for direct-current generators eliminates hunting tendency and embodies greatly improved speed of control operation. Ease of adjustment is a feature—*p. 162.*

Clarke loses Dubuque utility suit

—**St. Lawrence plans drift** inevitably as many problems arise which can only be settled by long and tedious procedures. Constitutionality of act and navigational considerations ahead of actual engineering—*p. 149.*

Beauharnois Power Investigation Reveals Sensational Financial Elements

LATEST among sensational developments in the investigation of the affairs of the Beauharnois Power Corporation before a special committee of the Canadian House of Commons was the statement by Robert O. Sweezey, president of the corporation, that contributions totaling about $954,000 had been made to federal political parties and to the campaign funds of the Liberal and Conservative parties in Ontario and Quebec. Proceeding under the protection of the Canada evidence act, the head of the Beauharnois enterprise disclosed that between $700,000 and $800,000 had been contributed to the Dominion Liberal party prior to the last general election and to the Liberal party in Quebec through Senator Andrew Haydon of Ottawa and Senator Donat Raymond of Montreal. Mr. Sweezey further stated that a proposal had been made that he contribute $200,000 to the Conservative Federal party. The contribution had never been made, as R. B. Bennett, then leader of the opposition in Parliament, had refused to accept it.

Another outstanding development was the refusal of Senator W. L. McDougald, chairman of the board of directors of the Beauharnois Corporation, to appear for examination, on the ground that the committee has no authority to investigate the conduct of a Senator. This action raised the ire of the Prime Minister and members of the investigating committee. Senator McDougald later consented to testify. He was charged by Robert Gardiner, leader of the Progressive party in the House of Commons, with having profited hugely through the Beauharnois deal.

In testifying, Senator McDougald told how, without knowledge of his own, W. L. Mackenzie King, now opposition leader in the Canadian House and at that time Prime Minister, had part of his holiday trip expenses to Bermuda paid by the Beauharnois Power Syndicate. The amount, when the error was revealed, was refunded, Mr. McDougald said. Evidence of the opposition of the late Sir Clifford Sifton to having the Sifton name connected with the Beauharnois project was also brought out.

Other evidence revealed that enormous profits were made by various individuals who were linked up with the enterprise from the beginning. Frank P. Jones, one of the promoters of the Beauharnois syndicate, testified that Walter G. Mitchell of Montreal, former member of Parliament, profited in the early stages of the syndicate to the same extent as himself—that is, by $785,000 on an initial outlay of $95,000. The evidence of Senator Donat Raymond disclosed that he had profited to the extent of $529,600 by his association with the company, but the Senator stoutly denied that he had used his influence with the government to secure the company's charter.

R. O. Sweezey compared the company's development scheme with the plans of the International Joint Board's "three-stage plan." He believed the former was a better plan. It would fit in with any future navigation development scheme on the river and, "it will be the best canal on the whole St. Lawrence," he said. The canal would be twice as wide as the Welland Canal and 33 ft. deep. It was being built in these proportions to permit future developments to be made at a low unit price. It was evident to any engineer, said Mr. Sweezey, that ultimately the whole flow of the river would be involved. This had not been made known to the government because it was considered an obvious fact.

▼

National Electric Power Gets Fitkin Properties

ACCORDING TO A recent announcement by Harry Reid, president of the National Electric Power Company, his organization has acquired control of the former electric, water and natural gas subsidiaries of Atlantic Public Utilities, Inc., from the reorganization committee, in accordance with its plan of reorganization dated March 20, 1931.

This plan provided for the formation of two new holding companies which have been formed, Northeastern Utilities Company and Northeastern Public Service Company, both Delaware corporations. The Northeastern Public Service Company owns more than 90 per cent of all the outstanding bonded debt and capital stocks of 68 companies included in the reorganizaiton. For the most part the operating companies are adjacent to existing operating companies in the National group and will be operated in conjunction with them. Northeastern Public Service Company is controlled by Northeastern Utilities Company. Control of the latter company now rests with National Electric Power Company.

The acquired companies represent electric, water and natural gas properties only. The plan of reorganization does not provide for the acquisition of certain subsidiaries of Atlantic Public Utilities, Inc., engaged in ice, traction and other operations.

Although Atlantic Public Utilities in 1929 showed assets totaling over $60,000,000, a large part of its assets are in the traction and other operations not taken over. It is estimated that this deal adds about $35,000,000 of assets to the National Electric Power group, making it a $525,000,000 holding company with properties in every state on the Atlantic Coast except Rhode Island. National Electric Power Company is a part of the Middle West Utilities System, one of the Insull group. Atlantic Public Utilities was formerly the property of the Fitkin interests.

A. E. Fitkin, chairman of the board of United American Utilities, Inc., has

▼ ▼ ▼

Beauharnois Hydro Construction Continues

informed stockholders of the completion of negotiations leading to acquisition of the former Atlantic Public Utilities properties and resulting "in the payment by the Insull interests, making liquid and releasing to United American Utilities, Inc., a substantial part of its capital. The company will continue its policy of acquiring and developing public utility properties and, with this cash available, will be in position to take advantage of favorable opportunities to purchase properties available on a profitable basis."

▼

British Progress in Rural Electrification

CRITICISM OF THE British national electrification scheme to the effect that in rural areas prices sometimes as high as 24 cents per kilowatt-hour will have to be paid are declared unfounded by those in charge of the plans. Actual experiments, they say, in Norwich and Bedford regions have shown that even for isolated farm dwellings the average price should not exceed 6 cents. Where there are one or two large consumers it will be possible to make the price over the entire area under 4 cents.

Out of about 600,000 hp. of machinery installed in farms in Britain at the present time probably not more than 10,000 hp. is electrically operated. If to this be added an estimate representing the electrification of farms in which no form of power has heretofore been used, it is possible to obtain a figure of 200,000,000 kw.-hr. per year, to represent a minimum potential consumption of energy by farms in that country at the present time.

Injunction Brings Lull in Kansas-Doherty Scrap

AFTER FOUR DAYS of testimony and argument by H. L. Doherty and state representatives before a District Court, Judge George H. Whitcomb issued a temporary injunction against the State of Kansas enjoining it from further action against the sale of Cities Service securities.

The requirement that a bond of $10,000 be posted by Cities Service to protect the state in the event that the injunction be later dissolved by the Supreme Court was made by Judge Whitcomb.

Roland Boynton, Attorney-General, announced that the state would appeal from the decision of Judge Whitcomb, and the basis for asking a review by the State Supreme Court, he said, would be that the 1929 securities act was declared unconstitutional.

▼

New York Commission Would Make Bills Uniform

FORMAL STEPS TO REQUIRE all gas and electric corporations in New York State to render their bills in such form as to enable consumers to determine readily the accuracy of the bills and to identify the corporation actually furnishing service are under way by the Public Service Commission. The commission ordered the companies to show cause at a public hearing why all bills rendered for service furnished to consumers should not be uniform and made to include certain information which the commission outlined for the use of all companies.

This form includes the name and address of the corporation furnishing the service, and no other; the office or offices where bills may be paid, suitable excerpts from the corporation's rate schedules printed on the back of the bill, showing the rate or rates charged for the service furnished, and the rate service classification on which the bill is based. Under this proposed form the bills would also show the date of the present and previous meter readings, the quantity used, the charge per unit quantity, the charges, if any, other than commodity, the gross amount of the bill, the amount of discount, the amount of penalty (if used) and the amounts of the bill, if paid on or before a certain date, or if not paid on or before a certain date.

This action was taken by the commission as the result of complaints received from consumers, who have stated that their bills do not clearly show the name of the operating company actually furnishing the service, and that they are not sufficiently clear to permit the consumer to determine the accuracy of the amount. To meet these objections from consumers the commission wants all companies to show clearly on their bills the amount of current consumed and the rate at which it is charged, so that the consumer may compute his own bill and determine its accuracy.

At the public hearing held last week, the Associated Gas & Electric Company led the opposition to the proposed uniformization of gas and electric bills. According to contentions of representatives of this company, the commission's jurisdiction does not extend to methods used in billing customers. The commission has given the companies until August 3 to file briefs to show reasons why bills should not be made uniform and subject to the specific regulations.

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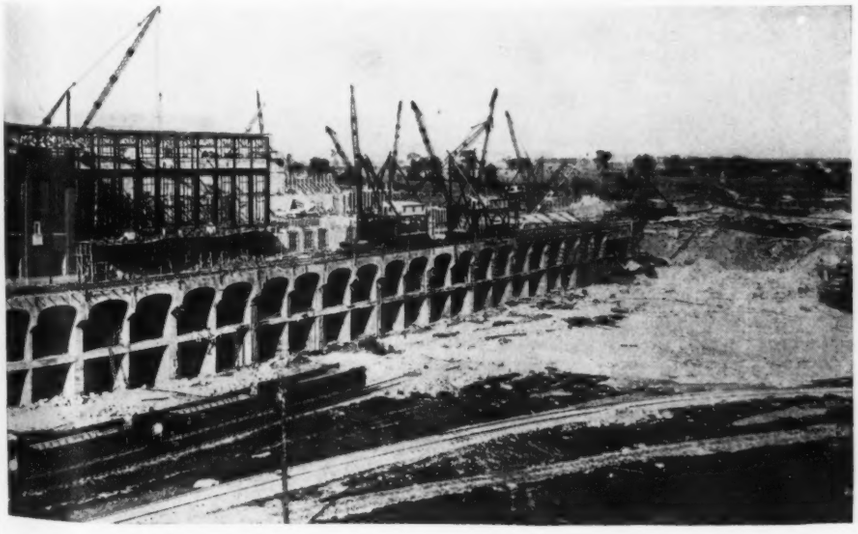
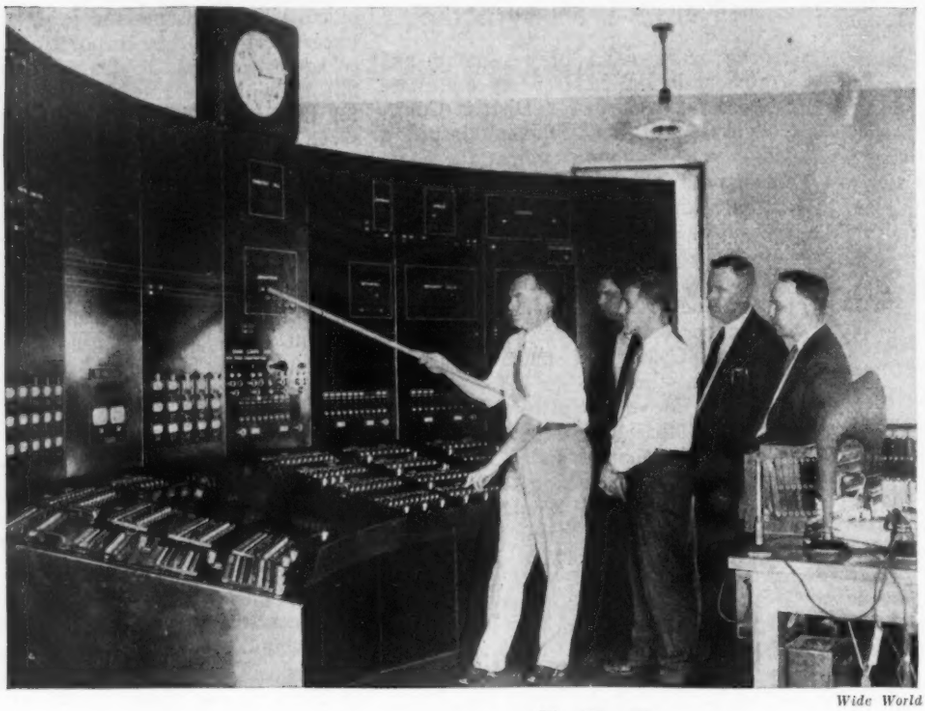
as Parliamentary Battle Rages in Canada



While various and assorted charges and counter-charges of syndicate profits and arbitrary changes in engineering plans without consent of Canadian government authorities are bandied back and forth and while reports of needs for new financing are heard, construction work on the Beauharnois development goes steadily forward.

The Beauharnois power house will contain ten 50,000-hp. units. Ultimate development is said to be possible here of 2,000,000 hp. but the Parliamentary investigation in Ottawa shows discrepancies between government and company engineering

SUPERVISORY REMOTE CONTROL FOR RAILROAD ELECTRIFICATION



Wide World

In planning its electrification program the Reading Company has taken full advantage of advanced engineering practices. This supervisory remote control unit, said to be the most extensive to be found in railroad practice, controls the entire electrical system of that road in the Philadelphia district. The station has just been placed in operation. Shown here is W. W. Gould, electrical supervisor of the Reading Company, pointing out various features to members of his staff.

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Eleven Orders Aimed at Control from Outside State

BELOW ARE PRINTED the eleven orders referred to on July 4 (page 5) as having been issued by the New Hampshire Public Service Commission in an attempt to remedy what it regards as interference with the proper regulation of local utilities by holding companies controlled beyond the state. In this instance the local companies to which the orders were issued are the New Hampshire Gas & Electric Company and the Derry Electric Company, and the holding company is the Associated Gas & Electric Company of New York, from which the courts forbade the commission to demand information. The attempted merger of the Derry company with the New Hampshire Gas & Electric was declared void. A petition for rehearing has been filed.

1. That the New Hampshire Gas & Electric Company and the Derry Electric Company shall hereafter borrow no money by open-account method except to such extent and upon such terms as may be approved by the Public Service Commission.

2. That the New Hampshire Gas & Electric Company and the Derry Electric Company hereafter pay no interest upon any sums owed under open account until the Public Service Commission, after notice and hearing, determine what terms are consistent with the public good.

3. That the New Hampshire Gas & Electric Company and Derry Electric Company hereafter pay no sums to the J. G. White Management Corporation under contracts of June 1, 1929, unless and until upon proper petition the Public Service Commission shall find said contracts to be for the public good and make an order assenting thereto.

4. That the New Hampshire Gas & Electric Company and Derry Electric Company henceforth discontinue the present practice of selling appliances for and on behalf of the Associated Appliance Corporation.

5. That so long as the New Hampshire Gas & Electric Company and Derry Electric Company do not engage in a so-called appliance business they shall not provide storage or other space for appliances sold or display space for appliances sold at their offices without adequate recompense therefor.

6. That unless and until, upon proper petition, the Public Service Commission by order authorizes the New Hampshire Gas & Electric Company to do business as a public utility in the territory served by the Derry Electric Company, said New Hampshire Gas & Electric Company shall not so engage in business.

7. That the New Hampshire Gas & Electric Company strike from its books all entries evidencing financial or other obligations made in connection with the purported acquisition by it of the franchises, works or system of the Derry Electric Company located in this state.

8. That unless and until, upon proper petition, the Public Service Commission by order authorizes the New Hampshire Gas & Electric Company to acquire the franchises, works and system of the Derry Electric Company, said New Hampshire Gas & Electric Company shall pay no sums as principal or interest on account of said purported acquisition.

9. That the New Hampshire Gas & Electric Company and Derry Electric Company forthwith discontinue the present practice of permitting certain of their employees to sell stock of the Associated Gas & Electric Company during hours when said employees are engaged to perform duties for said utilities.

10. That the New Hampshire Gas & Electric Company and Derry Electric Company shall maintain in the state original books and records relating to all details of operation and management until upon proper petition the commission shall otherwise order.

11. That the New Hampshire Gas & Electric Company and Derry Electric Company contribute no sum for the maintenance of a general office and staff in association with foreign trusts or corporations outside the State of New Hampshire, except such as may, upon proper petition, be approved by the Public Service Commission.

▼

Work at Hoover Dam Continues Despite Heat

WITH THE TEMPERATURE ranging from 110 to 116 deg., work in connection with Hoover Dam is being carried forward under difficulties. During the past week the recording thermometer in the canyon showed temperatures as high as 126 deg. Despite this fact, work has continued on most jobs without interruption. It has been necessary in two or three instances to work at night instead of during daylight hours.

A meeting of the Colorado River Board will be held next month to consider some of the tests that have been made, particularly the model tests on spillway structures which are in progress at Fort Collins and at Montrose. Tests on Arizona concrete are continuing at Las Vegas. High-velocity tests are being made at Guernsey. One block will be selected for a long-time test to develop the effect of velocity

only. At Denver work is in progress in the concrete laboratories on the technique of various tests. An outline of research studies is being made. A number of preliminary tests for concrete constants have been made. Three shifts daily are at work on the railroad along the Nevada cliff.

Power became available in Boulder City early this month. The electrical distribution system in Boulder City will be constructed by government forces. This decision was made so that the work could be co-ordinated with other construction in progress.

▼

Indiana City Plants Allowed to Make Profit

MUNICIPALLY OWNED UTILITIES in Indiana are entitled to operate at a reasonable profit just as are privately owned plants, according to a recent decision by the Indiana Supreme Court, made by a three-to-two vote. The opinion, it is believed, will increase the number of municipally owned utilities in the state since they will be permitted to make money and turn it over to the city government. It overrules a holding of the Indiana Public Service Commission and reverses a judgment given by Jere West, now a member of the commission, who tried the case of Logansport against the commission in 1926. Previously all municipally owned utilities were compelled to render service at cost, not including interest on capital invested.

Principal points contained in the opinion were that the state, not the city, has the power to regulate the rates to be charged by municipally owned utilities; that the act creating the commission expressly applies to municipal utilities and the commission has authority thereunder to fix the rates to be charged the public by the city of Logansport; that a municipal utility is entitled to receive a fair return by way of interest upon the investment, but that a municipal utility is not entitled, in addition to a reasonable return upon its investment, to charge rates high enough to compensate the city for the taxes which would be paid upon the plant if it were privately owned.

▼

New Continuous Plate Mill Has 30,000 Hp. in Motors

WHAT IS SAID to be the largest mill installation ever made for the rolling of a steel product has been completed for the United Engineering & Foundry Company at Pittsburgh, Pa. At this plant plates are manipulated entirely by mechanical means — the human hand never touches the rolled product. Motors of approximately 30,000 hp. are required to operate the mill. It is possible to roll plates continuously up to 92 in. in width and a finished ribbon of steel is possible up to 140 ft. The delivery speed of the plate mill varies from about 350 to 700 ft. per minute. The total length of the mill from the soaking pits to the finishing end is 2,100 ft., or more than one-third of a mile.

Continuous operation is carried out to the greatest possible degree. Starting with an ingot, the steel passes through a universal slabbing mill, which is so arranged that the finished plate can be rolled in one heat from the ingot, or by slabs being reheated in continuous slabbing furnaces. After leaving the slabbing mill, the steel goes through one stand of scale-breaking rolls, three stands of two-high roughing rolls, two vertical edging roll stands and then six stands of four-high finishing rolls. After passing through the continuous plate mill, the plate goes through plate leveling machines, is carried over spool-type cooling conveyors, goes to the plate turnover for inspection and finally passes through various types of shears, one type of which is considered remarkable for accuracy and method of handling.

The entire mill is under electric control, both for controlling the thickness of the plate and the operation of the side guides and looping apparatus. The driving motors are of adjustable speed.

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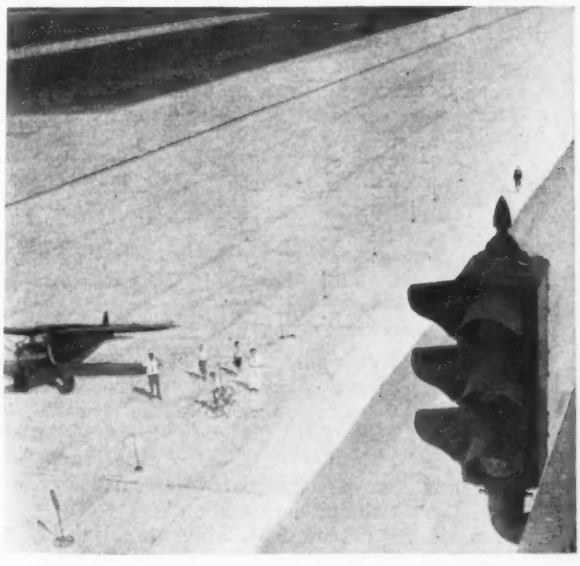
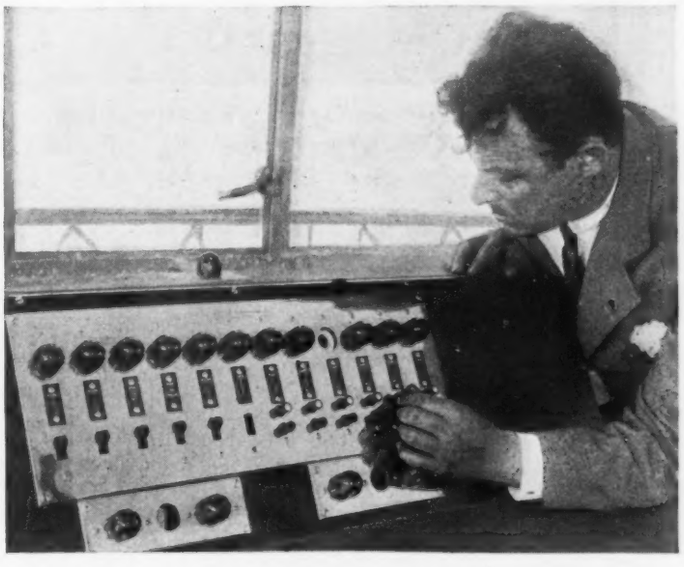
LIGHTING SPECIALIZED FOR HUGE NEW YORK AIRPORT





In planning the electrical features of the recently completed Floyd Bennett airport of the city of New York every endeavor was apparently made to adopt new and tried elements to improve airport conditions. Here are two examples: Field lighting is supervised from a remote-control tower room. This panel controls all the floodlights throughout the field as well as beacons and incidental lights. A traffic light system has been installed too, and no plane may take off, land, taxi or make a right or left turn when the light is against it.

Hoover Dam Power Too Costly for San Diego?

THAT HOOVER DAM power will prove too costly for the city of San Diego is the statement made in a letter written by W. F. Raber, vice-president and general manager San Diego Consolidated Gas & Electric Company, and addressed to Mayor Walter W. Austin. Mr. Raber told the Mayor that electrical energy could be generated locally by steam more economically, even should the government reduce its estimated charges 50 per cent. The letter was in the nature of a refusal to act as an agent in bringing Boulder Dam energy to San Diego. The Metropolitan Water District of Southern California had previously been approached by the San Diego city officials with a similar request, which was refused on the ground that the district was in no position to guarantee San Diego that it could carry and deliver electrical energy to that California city.

The City Council of Riverside, Calif., has decided not to contract for Boulder Canyon power for that municipality for a period of 50 years. Editorials published in local newspapers expressed the opinion that the city is amply protected by the private-company facilities now available. Riverside is served by the Southern Sierras Power Company.

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EINSTEIN HAS PASADENA SCIENTISTS STIRRED UP

—*Keystone View Co.*

By this apparatus, measuring light flowing through an electric potential field, Edward M. Thorndike, research fellow in physics at the California Institute of Technology and co-experimenter with Roy J. Kennedy, has shown that electric charges in the sky do not cause the Einstein "red shift." This theory supports the interpretation of Dr. Edwin Hubble.

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Dubuque Electric Suit Decided; Clarke Loses

BY A JUDGMENT FILED in the Supreme Court last week the Utilities Power & Light Corporation, of which the president is Harley L. Clarke, lost a suit filed in 1926 aganist Victor and Albert Emanuel, capitalists, and others arising from the sale to Mr. Clarke's company of the stock of the Dubuque Electric Company and its subsidiaries, the East Dubuque Company and the Eastern Iowa Electric Company.

The complaint charged a conspiracy to deceive the buyer as to the earnings of the Dubuque companies, and named among other defendants the Consolidated Utilities Company, which the Emanuels owned, and the Albert Emanuel Company, both of which were liquidated after the sale of the Dubuque companies' stock to Utilities Power & Light.

The dismissal was based on a decision by John Godfrey Saxe, named as referee to decide the case, who began hearings in April, 1930. The result was a judgment for Victor Emanuel against the plaintiff for $20,630, of which $20,422 represented payments which he made as the cost of the reference.

$100,000,000 Indiana Merger Sans Write-Ups

EVIDENCE CONCERNING the proposed merger of five utility companies having a total capitalization of $100,813,750 into two groups has been taken under advisement by the Indiana Public Service Commission.

Representatives of the companies, all of which are owned by Samuel Insull and his associates, introduced testimony tending to show that the merger would result in considerable elimination of administrative, operative and financing expense. They contended that these savings would be reflected in reduced rates to the consumers of the products.

No testimony in opposition to the merger was offered, and Commissioners Howell Ellis and Harry K. Cuthbertson, who presided at the hearing, announced that a decision would be handed down after the commission's engineers and accountants had made additional investigations.

The companies involved in the larger of the two mergers are the Public Service Company of Indiana and the Indiana Electric Corporation.

The other merger includes the Northern Indiana Power Company, the Wabash Valley Electric Company and the Attica Electric Company.

Documentary evidence introduced by the officials indicated that the capitalization of the Public Service Company of Indiana and the Indiana Electric Corporation, now $80,619,550, would be reduced to $79,268,566 by the merger, and that the annual interest charges on the securities issued by the merged companies would be reduced from $3,506,439.50 to $3,229,771.50.

The capitalization of the other three companies to be merged would remain the same, $20,194,200, and the annual interest charges would continue to be $778,554.

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Shannon Troubles Grow Quieter

AFTER DEBATING THE TANGLED FINANCES of the Shannon Electricity Board for three days, the Dail authorized the payment from state funds of a further $10,000,000 to meet the immediate needs of the board and at the same time stabilize the situation.

Patrick McGilligan, Minister of Commerce and Industry, stated late last week that chaos in the board's accounts had already been reduced to order. No figures, however, could be revealed or adjustments made, he said, until the auditors had completed their report of the 1930-1931 position of the organization.

Scattered Happenings in the Electrical Sphere

UNITED STATES

Maine Citizens Want Own Utility

The first attempt by a group of citizens to form an electric utility company under a new law which became effective July 3 has just been made in a petition to the Public Utilities Commission by 35 citizens of Alna. The petitioners allege "inadequate electric service" in Alna and vicinity and ask the right to form a company to furnish electric power in the territory and that the commission determine a fair price at which such power may be purchased from the Central Maine Power Company.

Early Niagara Plant Shut Down

The Toronto Power Company plant, owned by the Ontario Hydro, one of the first electrical units to be constructed at Niagara Falls, is to be abandoned and the water taken there will be diverted to the giant plant at Queenston. The old plant will be maintained as an emergency unit. For the last five years the Toronto plant has been working only part time, being able to generate only one-quarter of the energy produced at the new and modern Queenston plant.

San Diego Considers Street Lighting

Lester S. Ready, consulting engineer of San Francisco and formerly chief engineer of the California Railroad Commission, has been employed by the City Council of San Diego, Calif., with instructions to investigate a proposition made by Fairbanks-Morse Company to install a Diesel electric municipal plant for downtown street lighting and also to investigate the possibilities of bringing natural gas to the city. Mr. Ready is also to make a general report on the costs of utility service to the people of San Diego. The street-lighting district in question is now being served by the San Diego Consolidated Gas & Electric Company, which also is to make a report on the possibility of serving the community with natural gas.

Kansas Commission for Negotiated Rates

According to recent reports the Kansas Public Service Commission has decided not to press the electric utility rate investigation announced last year. Charles W. Steiger, the commission's general attorney, has announced that utility corporations are to be given an opportunity to work out lower schedules. The commission, it is said, now has under way inquiries into telephone rates and practices, as well as gas rates, but conferences with officials of the electric utilities have indicated that lower rates can be made effective by agreement rather than through hearings and formal orders.

ABROAD

Plan for Norwegian Power Export

Recent reports to the Commerce Department indicate that plans to export electrical energy from Norway to Germany and Denmark will be closely studied by a joint international share company formed by Norwegian, Swedish, Danish and German interests. This organization, the Limited Company for Study of Norwegian Current Export, will be chiefly active in research. The technical, economic, financial and legal sides of the question are to be considered and, if possible, practical solutions of all of them submitted. Technical difficulties have interposed in all previous plans for the export of Norwegian power to Germany and Denmark. The plan has created considerable interest in Norway, as that country would, it is said, benefit considerably if some of its undeveloped water power could be made into a source of supply for other countries.

Coming Meetings

Camp Co-operation XI — Association Island, Henderson Harbor, N. Y., July 27-31. Society for Electrical Development, 420 Lexington Ave., New York.

American Institute of Electrical Engineers—Pacific Coast Division, Lake Tahoe, Calif., Aug. 25-28. F. L. Hutchinson, 33 W. 39th St., New York.

Rocky Mountain Division, N.E.L.A. —Stanley Hotel, Estes Park, Colo., Sept. 2-4. G. E. Lewis, 367 Gas & Electric Bldg., Denver.

Electrochemical Society — Hotel Utah, Salt Lake City, Sept. 2-5. C. G. Fink, Columbia University, New York.

Pennsylvania Electric Association — Bedford Springs Hotel, Bedford Springs, Pa., Sept. 9-11. H. A. Buch, Telegraph Bldg., Harrisburg, Pa.

Empire State Gas and Electric Association—The Sagamore, Bolton Landing, Lake George, N. Y., Sept. 10-11. C. H. B. Chapin, Grand Central Terminal, New York.

American Welding Society — Copley-Plaza Hotel, Boston, Sept. 21-25. M. M. Kelly, 33 W. 39th St., New York.

New England Division, N.E.L.A.— Poland Springs House, South Poland, Me., Sept. 28-30. Miss O. A. Bursiel, 20 Providence St., Boston.

Great Lakes Division, N.E.L.A.— French Lick Springs Hotel, French Lick, Ind., Oct. 1-3. T. C. Polk, 20 N. Wacker Drive, Chicago.

Illuminating Engineering Society—William Penn Hotel, Pittsburgh, Oct. 13-16. E. H. Hobbie, 29 W. 39th St., New York.

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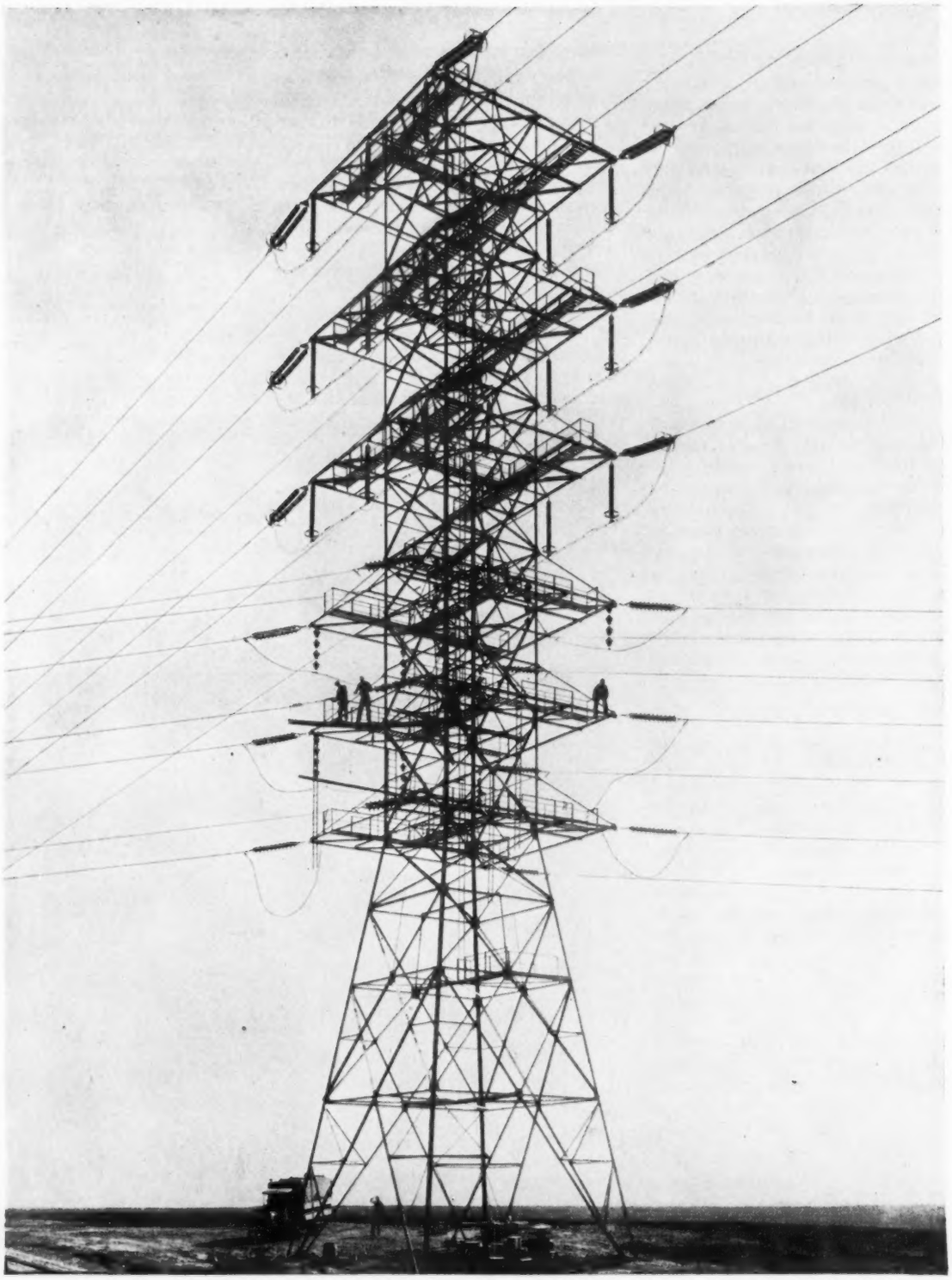
EMPIRE STATE BUILDING AS A LIGHTNING ARRESTER

A model of the Empire State Building in the high-voltage laboratory of the General Electric Company at Pittsfield repeatedly intercepts bolts of 5,000,000-volt artificial lightning, thus affording proof of the protection afforded by New York's highest skyscraper to the lower buildings in its neighborhood.



220 kv. crosses 110 kv. with safety assured

This 158-ft. tower is designed to insure adequate separation and safety at a cross-over involving two 220-kv. and two 110-kv. lines of the Southern California Edison Company and the city of Los Angeles. All lines are dead-ended and so jumpered hat a failure of any one wire cannot in any way involve another circuit. Walkways, ladders and locked gates provide safety for workmen.

EDITORIALS

L.W.W.MORROW
Editor

Kansas starts something

KANSAS has a well-earned reputation for starting things and the latest happenings in that state are of significance to utilities—filled with human and legal interest. There are three fundamental issues brought up:

1. The validity of an interstate pipe line company fixing a uniform rate for gas to all state distributing companies independently of a state utilities commission.

2. The authority of a state to bar the sale of a listed and reputable holding company common stock.

3. The liability involved by a newspaper attack on a utility executive.

All these issues are focussed upon the Cities Service Company and its executive, Henry L. Doherty. The opponents are Governor Woodring of Kansas, the State Banking Department, the Kansas City *Star* and others.

With characteristic energy Mr. Doherty has fought for his company interests and his personal integrity. Court battles are under way to establish the legal aspects of interstate rate making and freedom in security sales and a $12,000,000 personal libel suit has been instituted by Mr. Doherty against the Kansas City *Star*.

Henry L. Doherty has courage. He has survived many battles and has built a big and outstanding public utility enterprise. He has been progressive in attitude and has contributed many good ideas in finance, rate making and management. In his public relations he is notable as a fighter when he believes his rights are challenged unjustly, and he has survived many local battles.

Thus the Kansas battle raises issues of fundamental importance to the utility industry in that it will establish legal precedents and bring to a focus attempts at libelous statements. Undoubtedly the battle will be disturbing to the industry and to its public relations, but the courage, experience and wisdom of Mr. Doherty bespeak for him hearty industry support in bringing out the facts and in helping toward decisions that are just. There comes a time when battles are necessary.

Regulation by conference has hopeful aspects

CONSUMERS and municipal representatives who attend formal commission hearings can excusably get the impression of a high and mighty tribunal which listens discreetly to contradictory allegations offered in the guise of evidence and then, retiring to seclusion, strikes a happy medium in its decision. Neither side is satisfied because, in the absence of a formal code comparable to court procedure, the essential confidence-inspiring element is missing. "What do the commissioners *really* think about us and our opponents?" remains an unanswered interrogation.

Open conference brings all three parties to parity. A round table in a congenial environment replaces the elevated bench and its attendant stiffness of atmosphere. Frankness on all sides has a chance for free play, and confidence grows in proportion. Motivation melts in the face of moderation. Facts flow without the restraint of tortuous evidential moves. Decisions can be much prompter. Trial schedules replace fixity and uneasiness. Understanding emerges where lack of confidence has ruled.

There are risks in the too rapid encouragement of this mediative functioning of commissions. To avoid them will require recognition of three factors. First, it will call for the highest grade of commissioner obtainable; a commissioner could

no longer hide his mediocrity in the non-committal attitude of formal procedure. Second, the commission decision, in the absence of documented evidence and briefs, must be confined to the agreements stipulated in the conference; any discretionary intentions should be fully disclosed during the conferences. Third, the governors must not usurp the field of conference regulation by writing letters to utilities demanding rate reductions willy-nilly and then using arbitrary punitive measures when answers to their peremptory demands are delayed until conference can be had.

In spite of these and other risks, regulation by conference holds hope of correcting those weaknesses of current regulation which have repeatedly led to the assertion that the regulatory system has broken down.

Examples more convincing than generalities

THERE has been a lot of talk regarding inadequate wiring being the "bottle neck" to unrestricted utilization of electric service and numerous attempts have been made to stimulate modernization. But the builders of domestic homes, commercial buildings and industrial plants, who have to part with money to secure an installation that will not hamper them in the future, are not always able to visualize the handicap of the ordinary run of wiring and their shortsightedness tempts them to save pennies.

Generalities fail to impress a prospective builder or tenant of a building. But if he could be personally shown specific cases where great inconvenience and expense were being undergone to adapt obsolete distribution systems to changed conditions his eyes might be opened. The more situations that can be brought to his personal attention during the reconstruction stage the more firmly he may be impressed, because, out of them all, at least one might recall a personal experience.

It is realized that these opportunities to display reconstruction work are seldom available in sufficient number or proximity to use this personal method, and even if they were, most prospects for adequate wiring might refuse to devote the time to inspecting them. But if every person in the electrical industry who is interested in removing "bottle necks" (and this should include power companies, manufacturers of power supply and utilization equipment and contractors) would co-operate locally and regionally to assemble specific illustrations of changes necessary, time consumed, inconvenience incurred, cost, etc., the compilation in booklet form could be used as a substitute for personally conducted tours of inspection in converting builders to adequacy of wiring. Eventually, these regional compilations might be culled and combined into national booklets, thereby providing the variety of examples necessary to convince skeptics.

Among some subjects for such treatment are the results of low-quality insulated wire, inadequate conduit sections to accommodate larger or more wires, no provision of space for new circuits, insufficient sectionalizing points, infrequent opportunities for tapping circuits, widely spaced load centers, etc.

Primary networks spur new thinking on radial systems

IF NEW ideas had no other effect than to stimulate new thinking on older but alternative practices, the innovations would be immensely valuable. Witness the advent of powdered fuel and its stimulation of stoker practice. Both forms of combustion progressed greatly when powdered fuel became a real factor and stokers refused to back down to the contestant. Too short a time has passed for any one to forget the effect that adoption of some European methods had on general improvement of high-tension cables. And application of more accurate control methods to fuel-fired ovens and furnaces have pushed electric oven and furnace builders to developing other superior qualities.

Now the primary network, widely heralded and adopted in a number of cases, has awakened introspection regarding what can be done with radial systems to avoid making them obsolete. R. T. Henry of Buffalo has had the courage of his convictions and demonstrates in this issue that by taking advantage of the latest ideas radial systems can be made economic competitors of primary networks. Among other things, he claims a low unit cost for substations due to simplification, avoidance of difficulty in com-

pensating for voltage drop in distribution transformers and secondaries, less possibility of undesired relay operation, and fewer miles of transmission cable than usually assumed for radial systems.

Whether he, as an advocate of modernized radial systems, or the proponents and users of primary networks are entirely correct in their contentions is not so important as the competitive development of alternative practices that will be provoked. Both practices will have to be developed so that weaknesses will be ironed out, and meanwhile cost of distribution, which bothers utilities as much as it does politicians, will be started on the decline. Both practices undoubtedly have fields of application and can be developed and simplified.

While these developments are going on there will be a continual need of economic comparisons, coupled with studies of relative reliability, simplicity, flexibility, so that engineers will have a more tangible basis for selection of systems used.

Structural steel welding profits by an idea

IN PLANNING for the erection of the steelwork for the new Allied Arts Building in Lynchburg, Va., the designing engineer was faced with today's familiar problem—to weld or not to weld. There were 316 tons of steel to be installed; a first-class hotel stood directly across the street; costs must be kept low. Noisy procedures were to be avoided. By the exercise of considerable imagination and ingenuity electric welding was applied to the job with all-around satisfaction and notable economy.

For this job an erection seat was developed consisting of an element, shop-welded to the columns, into which connection angles, welded to the beam, are slipped. The loose connection is sufficiently firm to stay the columns until field welding can be done. This eliminates all, or virtually all, shop punching and, of course, the use of erection bolts.

Savings were substantial and the elimination of field bolts and punched holes played an important part in the economy. The price bid for the steelwork with welded construction, following this plan, was $1,975 less than for riveted construction of the same type. Resourcefulness and ingenuity have solved another problem in the application of electricity to the work of the world.

Keeping a check on customer satisfaction

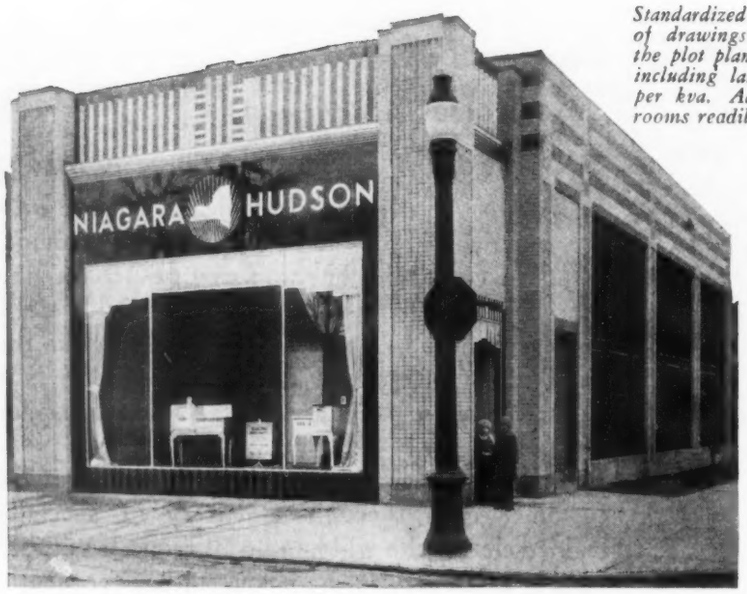
CUSTOMER good will is frequently earned or lost by the way in which telephone calls are handled. Still, in most cases the managements of companies have no way of determining the effect of telephone conversations. Recently, however, there has been a tendency to revise the handling of customers' calls so that there is a closer check on individual contacts and customer reaction.

Reference is made to (1) the clearing of all customer calls through a battery of specially trained clerks who will handle all requests without putting customers to the inconvenience frequently experienced, and (2) providing facilities for monitoring any customer call to ascertain how it is handled. On one system a young lady who is impressed with the fact that she must maintain a customer viewpoint unmodified by knowledge of utility problems is continually engaged in checking the manner in which each of these customer-call clerks handles calls. Each clerk is marked on a variety of factors that contribute to customer satisfaction.

The information obtained from this monitor system has been helpful in training new public contacts, improving methods used by older employees, securing a detached viewpoint of what irritates the public and correcting conditions or methods that are distasteful. It is possible to extend this system to checking office conversations with customers by having microphones on various counters or desks at which customers converse with employees.

Success of the monitor system depends largely on the way its purpose is presented to employees. If they are convinced that it is not used for spying, but rather for determining how to make customer relations most agreeable, the new facilities should be very helpful in analyzing and solving customer relations and employee-training problems.

100,000-Kw. Distribution System a



Standardized distribution substation. One set of drawings covered 24 substations. Only the plot plans differed. Average over-all cost including land and buildings less than $15 per kva. Additions cost still less. Display rooms readily added to standardized station.

By R. T. HENRY

Electrical Engineer in Charge of Design
Buffalo, Niagara & Eastern Power Corporation,
Buffalo, N. Y.

BEFORE the end of the present year the largest distribution system ever built as a single project will be completed in Buffalo. This new system required the construction of 35 miles of underground conduit with 250 miles of 22-kv., three-conductor cable, 24 substations, 34 low-voltage network vaults with the necessary mains and the revamping of the distribution feeders in a territory covering 65 square miles with more than 600,000 population. The total expenditure involved will be in excess of $10,000,000. More than 100,000 customers are being changed from 25 to 60 cycles at the rate of approximately 1,000 customers every week, summer and winter.

Buffalo has always distributed 25-cycle service, largely because the principal source has been 25-cycle power from Niagara Falls. The load in Buffalo now far exceeds the power available from Niagara Falls under the prevailing limitations of diversion and the excess must be supplied from the C. R. Huntley steam plant, which now exceeds the total hydro-electric capacity on the American side at Niagara. Part of this steam capacity is 60 cycles and, with interconnections to the 25-cycle system through frequency changers, serves as the principal supply to an extensive 60-cycle transmission system which is being built up in western New York as a part of the state-wide Niagara Hudson system.

The new 60-cycle distribution system is to take over approximately 100,000 kw. of lighting and commercial load which has been supplied principally at 25 cycles, with smaller amounts supplied at 62½ cycles and Edison d.c. The balance of the load, amounting to approximately 130,000 kw., principally industrial load, will remain 25 cycles for the present.

With such an extensive system to be built, it was necessary to give very careful consideration to all of the types of distribution systems available before deciding which was to be used. The low-voltage a.c. network was adopted as the best system for the principal business district almost without question. For the rest of the territory a number of different schemes were considered. Early studies clearly indicated the advantage of small, automatic substations with short distribution feeders and the choice soon narrowed down to two schemes, one being the primary network and the other the radial system finally adopted. The decision in favor of the radial system over the primary network was based on three very definite reasons:

1. *Regulation*—The voltage level in a primary network may be quite uniform, but it is practically impossible to apply load compensation without involving instability between regulators. This is a very serious difficulty, particularly when it is recognized that in a properly designed system the principal voltage drop between the substation and the customer is in the distribution transformers and secondaries. In any radial system load compensation can be applied to overcome this drop as well as the drop in the feeder.

2. *Relaying*—It is very doubtful if any relay scheme which has been suggested up to date will prove to be a satisfactory solution of the problem of relaying an extensive primary network. This problem becomes very difficult on account of irregularities which appear in most actual applications. It usually happens that where the tie feeders would naturally be shortest they must be underground. The impedance of different tie feeders may vary at least 5 to 1 in many cases and, under such conditions, there is very real danger of undesired relay operations, particularly if some units are out of service. In a properly designed radial system the relaying problem is quite simple, even when "back-up" protection is included.

3. *Cost*—Even if these difficulties could be met, comparative estimates indicated that the cost of the radial system adopted would be at least 10 per cent less than the cost of a primary network for this territory. In the application of the primary network scheme to a large area it becomes necessary to connect a number of units to each transmission circuit. These units must not be adjacent and should not even be alternate in the network, but should be separated in every direction by at least two and preferably more than two other units connected to as many different transmission circuits. It can readily be seen that when this idea is applied to a large area it results in an excessive mileage of transmission circuits and becomes very costly, particularly when all high-tension transmission circuits must be underground, as is the case in Buffalo. This same difficulty is encountered to some extent in the low-voltage a.c. network, but on account of the short distances involved it is not nearly so serious as in the primary network scheme.

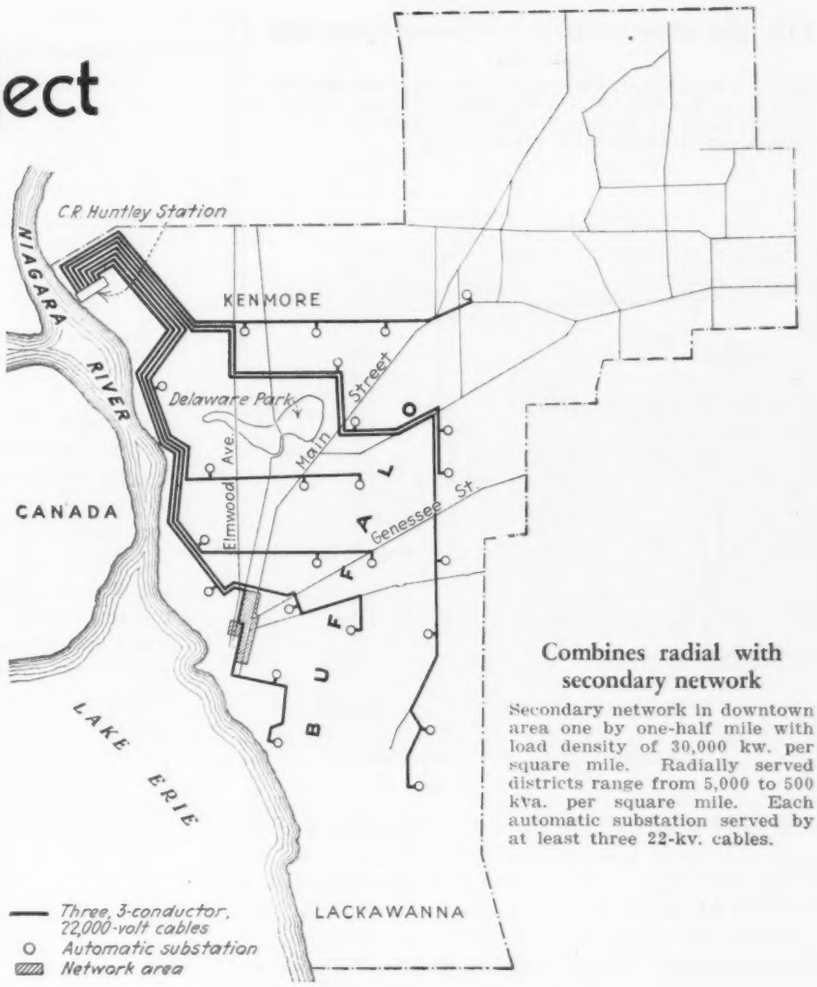
as a Single Project

Entirely new 60-cycle system covering 65 square miles superposed on 25-cycle system.

Twenty-four substations from one set of plans.

Radial system found better and cheaper than primary network for this territory.

Secondary network and radial substations served from single system of feed cable.



Combines radial with secondary network

Secondary network in downtown area one by one-half mile with load density of 30,000 kw. per square mile. Radially served districts range from 5,000 to 500 kva. per square mile. Each automatic substation served by at least three 22-kv. cables.

The cost of substations is bound to be higher when they are subdivided into smaller units to suit the primary network.

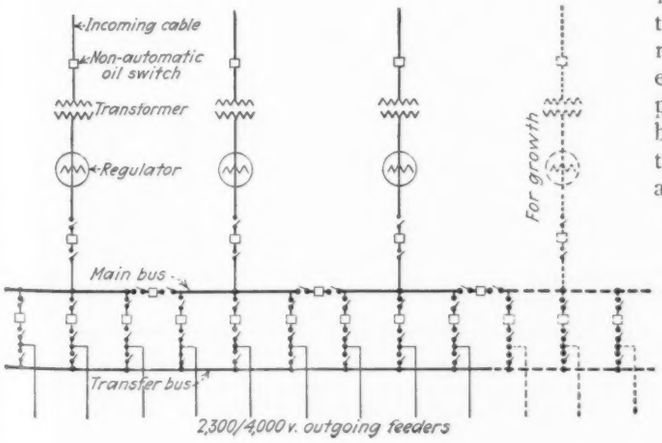
It is doubtful if the cost of distribution feeders will be appreciably less for a primary network than for a properly designed radial system. While under normal conditions half of the load on each tie feeder is supplied from each end, the capacity of each tie feeder must be such that with a network unit out of service all of the load may be carried from one end. Further than this, in the case of "fringe" units the tie feeders from adjacent units must carry not only all their own load but part of the load of the feeders which do not connect other units.

The new distribution system in Buffalo has practically all of the advantages of the primary network without its disadvantages. There are 24 substations, located approximately a mile apart, except in the outlying sections. The distribution feeders are quite short with the exception of those extending into the outlying sections, where the load density is very low. Each feeder serves only 800 to 1,000 kw.

The substation design is such that both substation load and low-voltage network may be supplied by the same high-tension cables. This permits taking advantage of the diversity between these loads in the high-tension cables and makes it possible to connect a larger number of different cables to the low-voltage network than would otherwise be economically possible.

In this system full automatic protection is provided for isolating faults in high-tension cables, in substation transformers or in induction regulators without any interruption to service and without any high-tension switching except at the generating station. Back-up protection is provided throughout in case of a failure of the proper breaker to clear a fault. There is very little disturbance to service in case of a high-tension fault, since the cables are not paralleled at the substations.

Full advantage has been taken of standardization, 72

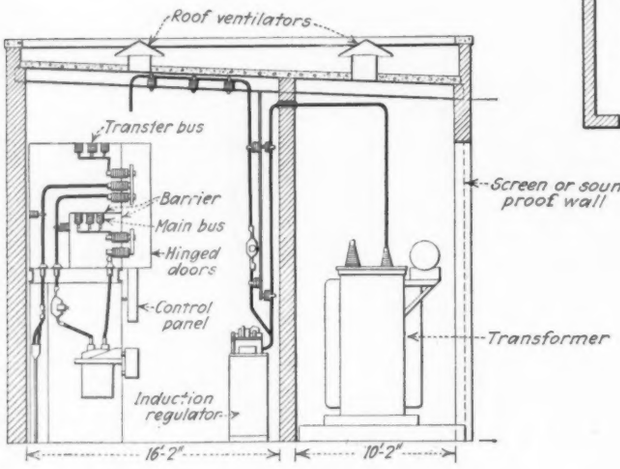


7,500-kva. bus-regulated substation

Any transformer, regulator, feeder breaker, or even an entire section of the main bus may be taken out of service without interrupting any feeder. Wattless current compensators prevent circulating current.

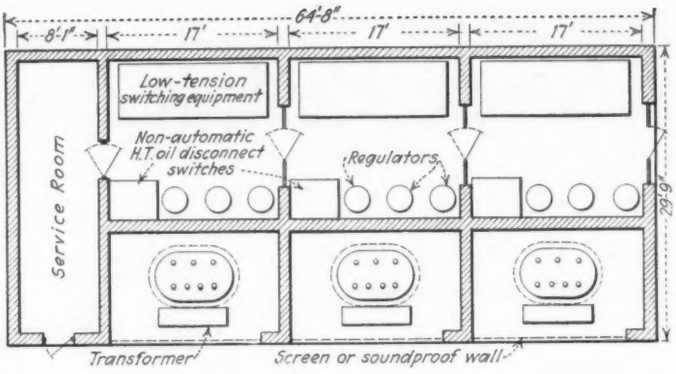
Unit type substation gives one-quarter square foot per kva.

Compact but accessible and safe. Two ways out for men in case of trouble. Fire walls between units. Transformers protected from intruders. Transformers readily inclosed where sound must be considered.



Metal-inclosed switching equipment

Main and transfer bus separated by metal barrier. Hinged doors in front of disconnects.



units in 24 substations being covered by one set of drawings. The only individual drawing for each substation is the plot plan. The external appearance has been modified in some cases to suit the surroundings, but otherwise one set of building drawings served for all of the substations. Thirty-four low-voltage network vaults are covered by one set of drawings, with only one individual location plan for each vault.

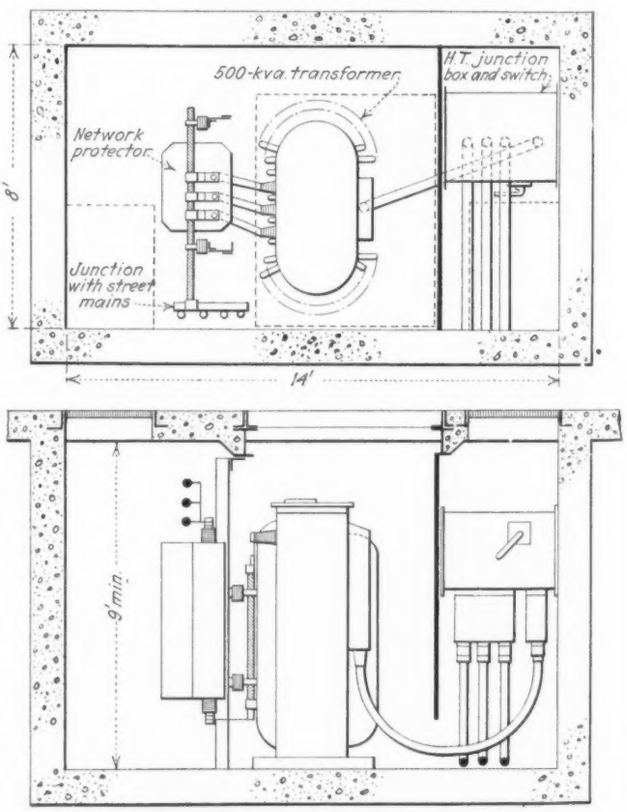
The entire system is served at 22 kv. directly from the generating station, which is located some 6 or 8 miles from the center of gravity of the load. Studies indicated that it would have been necessary to make a saving of about 10 miles in the average length of the 22-kv. cables in order to justify high-voltage transmission to a distributing center nearer the load center. If at some later time other sources of power become available another distributing center may be established, as was previously done in the 25-cycle system for similar reasons.

Each substation consists of a number of standardized units with a small service room common to all units. Each unit consists of a 2,500-kva., three-phase, 22,000/2,500–4,330-volt, self-cooled transformer, with the necessary regulators and switching equipment. There is no high-tension bus and no high-tension switching equipment except that a non-automatic oil disconnect for each transformer is supplied from a different high-tension cable. Each cable supplies one unit in each of several different substations. Studies indicate that the saving in high-tension switching equipment more than justifies the additional cable required for this scheme as compared with substations with high-tension buses and switching equipment.

No attempt will be made to disconnect transformers during light-load periods to save core loss. Studies indicated that the saving in losses would not justify the additional switching and control equipment necessary to accomplish the saving. Greater security to the service further justifies having all the transformers connected.

The initial installation consists of three units at each substation, but provision is made for at least five units at each location. By reference to the diagram it will be noted that any transformer, regulator, feeder breaker or even an entire section of the main bus may be taken out of service without interrupting any feeder.

Relaying is quite simple, even with complete "back-up" protection provided. Feeder breakers have overload relays and reclosing relays, bus tie breakers and transformer low-tension breakers have overload relays and are set to clear bus faults or to operate on feeder faults if the feeder breaker fails. The transformer low-tension breakers also have directional relays to clear faults in a high-tension cable, transformer or regulator.



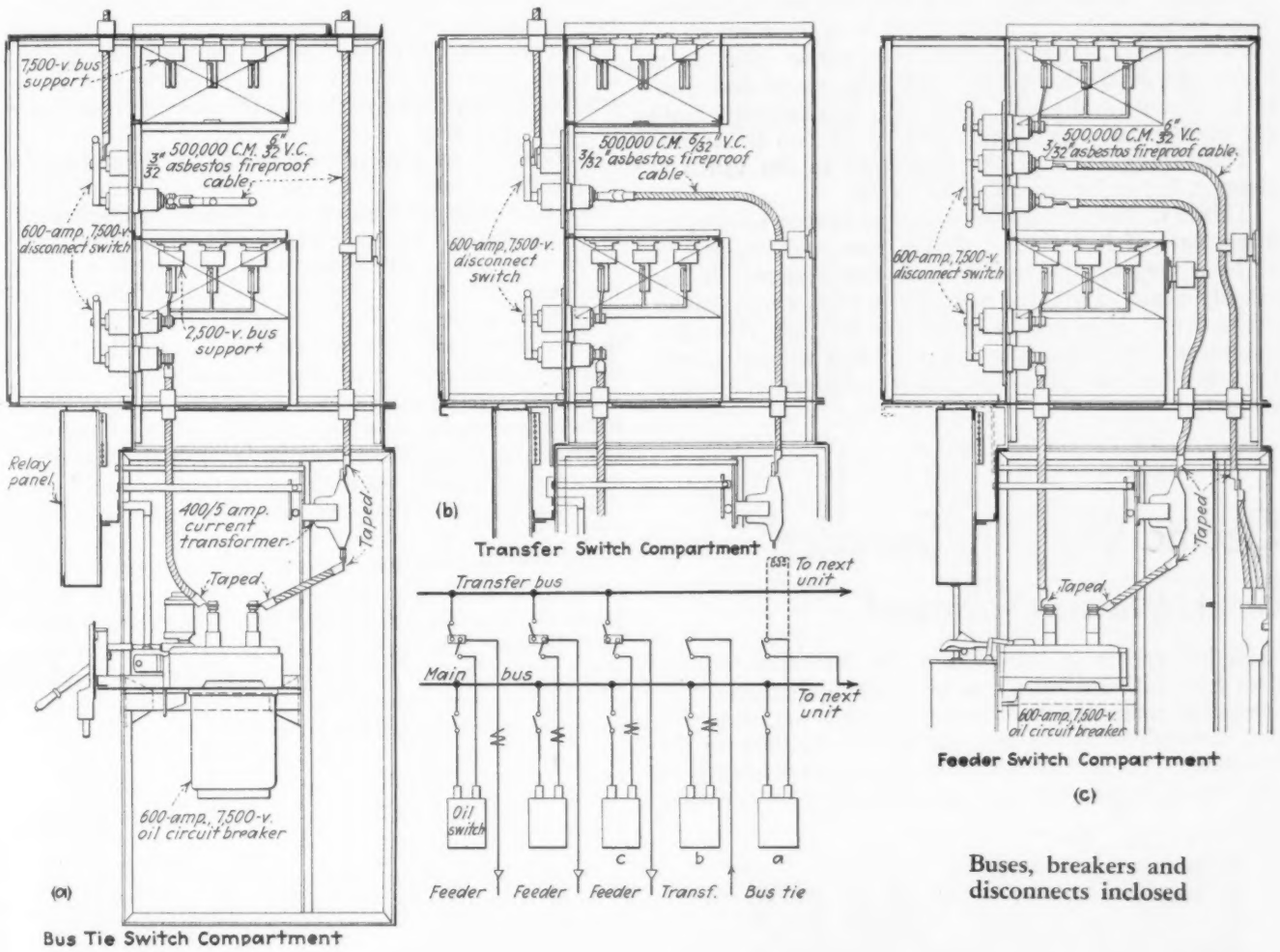
Independent units in network vault

Cables not disturbed nor continuity of low-voltage grid broken when changing transformers. Non-leaded connections on 7,500-volt porcelain supports.

The short-circuit capacity is very low, being only 65,000 kva. at the 4-kv. bus of a three-unit substation. Bus reactors will permit adding units without increasing this value. In a four-unit substation one set of bus reactors rated 5 per cent at 2,500 kva. will be installed in the center and in a five-unit substation one set of bus reactors will be installed each side of the center unit. This arrangement can be extended indefinitely if necessary.

It will be noted that these substations are arranged for bus regulation, this being satisfactory with the short-noise must be considered. The units are separated by fire walls and are equipped with automatic fire extinguishers.

The space required for a five-unit substation is only 30x100 ft. x 18 ft. high. The installed capacity of such a substation is 12,500 kva. The area occupied is, therefore, 0.24 square feet per kva. and the volume is 4.32 cu.ft. per kva. Any substation not located with its transformers adjacent to a street or alley requires a handling space in front of the transformers, but the area occupied including this is only 0.33 square feet per kva.



Buses, breakers and disconnects inclosed

distribution feeders. A simple wattless current compensator scheme is used to prevent circulating current since the regulators are paralleled on the output side. With this scheme load compensation can be applied without involving instability between regulators. The load compensators are adjusted to overcome the drop in the distribution transformers and secondaries as well as the drop in the feeders.

The physical arrangement of the equipment in these substations is very compact, but accessible and safe. All of the switching equipment and regulators are located along a common aisle extending the entire length of a substation. There is no point in a substation where men have occasion to work without at least two ways out in case of trouble. Transformers are placed in compartments open to the outdoor air, but are well protected from intruders, and they can readily be inclosed where

The low-voltage a.c. network in Buffalo covers an area about ½ mile wide and 1 mile long. It is supplied at 22 kv. directly from the generating station. The charging current of the long high-tension cables requires the installation of shunt reactors to insure the operation of the network relays and to avoid excessive voltage rise on the network in case a protector fails to open. These shunt reactors are star-connected with the neutral grounded and the magnetic circuits are so arranged that, while the reactive current is quite small under normal conditions, it increases very considerably if one phase of the circuit is grounded.

The transformers are 500-kva., three-phase units on account of the high transmission voltage and the inherent reactance is 5 per cent. External reactors will be used if necessary.

A junction box is included with the high-tension dis-

connecting switches to avoid "Y" splices in the high-tension cables. These are mounted separately from the transformer to avoid disturbing the cables when changing transformers. The protectors are also mounted separately from the transformers to avoid disturbing the cables and breaking the continuity of the low-voltage grid when changing transformers.

The heavy connections between the transformers, protectors and the junction with the street mains are 2,000,000-circ.-mil, non-leaded cable on 7,500-volt porcelain supports and with porcelain bushings at the transformers and protectors. This construction is considered practically "failure-proof" even with the vaults flooded. The junction with the street mains is in the form of an open bus on 7,500-volt porcelain supports. The street mains are 500,000 circ.-mil with $\frac{1}{8}$-in. paper and $\frac{1}{8}$-in. lead. The neutral is No. 0000 with weatherproof braid for mechanical protection to lead sheaths on the mains.

The arrangement of the equipment in the vaults is compact but quite accessible and safe.

This new distribution system is now in successful operation, part of it for more than a year, and has proved to be a very flexible, reliable, efficient system. It has already cleared a number of faults in high-tension cables without any interruption to service and has cleared a number of faults on distribution feeders without affecting other feeders. It is giving entire satisfaction in every respect.

▼

Electric Welding Speeded by Thyratron Control

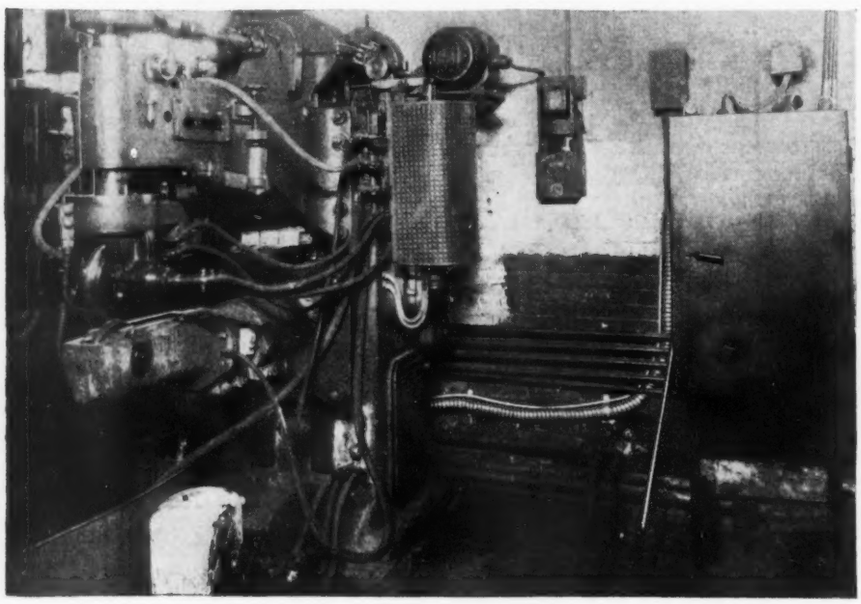
Higher speeds in intermittent line and spot welding than have hitherto been possible with mechanical interrupters or magnetic contactors are said to be practicable now through vacuum-tube control. In addition to the advantage of high speeds, contact wear is eliminated both on the contactor tips and on the entire mechanical assembly. Interruptions as high as 1,000 per minute are readily handled with this General Electric equipment.

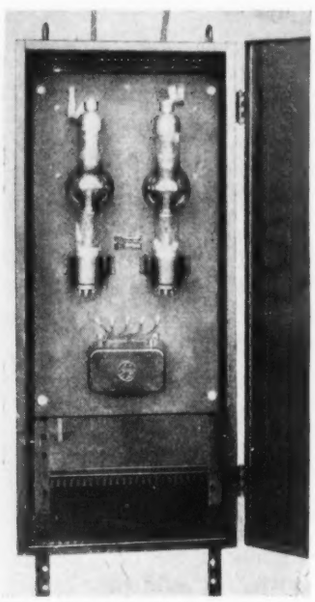
In this system there is placed, in series with the primary of the welding transformer proper, the primary of a series transformer whose secondary is wound for a high voltage. Connected to the high-voltage winding are a pair of "Thyratrons" which, when conducting, virtually short circuit the high-voltage winding. When the high-voltage winding is short circuited the impedance of the primary or low-voltage winding of the series transformer is low, thus permitting approximately full-load current to pass to the primary of the welding transformer proper. Conversely, when the "Thyratrons" are not conducting the high-voltage winding of the series transformer is open circuited and the impedance of the low-voltage winding is at a maximum, thus permitting practically no current to flow in the welding transformer primary circuit.

Conduction or non-conduction of the "Thyratrons" is controlled by imposing an "in-phase" or "out-of-phase" voltage on their grids; this is accomplished mechanically by the closing or opening of a small single-pole switch. In an actual installation on an intermittent line welding machine this switch takes the form of a cam-operated switch. The cam which operates this switch may be driven by a variable-speed motor, the speed of which determines the number of welds per minute.

The control consists of two essential parts, the series transformer and a control panel. The series transformer is ordinarily a standard distribution transformer and is mounted at a point conveniently near the control panel. On the control panel are mounted two hot-cathode "Thyratrons," the filament transformers, grid transformer, a time-delay relay and the necessary resistors, capacitors, etc. The only equipment mounted on the front of the panel is the two "Thyratrons" and the time-delay relay. The entire panel is inclosed in a sheet-metal case which is provided with high-voltage bushings for the entrance of secondary leads of the series transformer and brackets for floor mounting.

Vacuum tube control speeds shop welding





St. Lawrence Development Faces Many Impediments

By S. BURTON HEATH

Secretary St. Lawrence Power Development Commission

Congress, power commission, War Department involved.

Treaty and boundary shift necessitated.

Canadian interests not reconciled.

Navigation an inescapable aspect from political angle.

BEFORE a single bond can be sold to finance New York's great hydro-electric project on the St. Lawrence River, or a spadeful of earth can be turned at Massena Point, the Power Authority appointed in April must explore successfully a maze of difficult and delicate negotiations which may delay for years the beginning of actual development.

The tasks remaining fall into a natural and somewhat inevitable sequence. First, the contract with the utilities, without which New York's own policy remains unsettled; second, application to federal authorities for War Department approval, a Federal Power Commission license, and possible congressional action; third, negotiations with Canada, through the federal government, of a treaty and other agreements; fourth, sale of the bonds, and, fifth, actual construction.

Some of these steps are merely formal. Others involve fundamental issues of national importance, in which the interests of New York are not always synonymous with those of other sections. Because the St. Lawrence River touches only New York in this country, that state has a primary interest. But the St. Lawrence is an international boundary stream, and legally navigable, so the United States has a double claim to control. Ontario and the Dominion of Canada are as much interested as New York and the United States. Our great inland empire of midwestern states looks upon the St. Lawrence as its natural outlet to the sea. All sorts of political, social and economic factors are present.

The interest of the federal government as a party in any settlement appears in two principal ways—through the federal water-power act and through the constitutional provision that only the federal government may treat with foreign nations. Acting through the War Department or the Federal Power Commission, or merely by congressional failure to co-operate, the United States can block New York forever. There are reasons why either the administration or Congress or both may prove reluctant to play the Empire State's game.

Federal restraints limit state freedom of action

Under the federal water-power act a license from the Federal Power Commission is required for power development on any navigable stream of the United States, which includes the St. Lawrence. No such license can be issued until the engineering plans have the explicit approval of the Chief of Army Engineers and the Secretary of War. The license must contain certain provisions which might prove very embarrassing to New York in the future, if applied literally.

For instance, agreements to limit output of current or to fix its price are prohibited, and it is of the essence of this plan that New York be free to limit output or to fix prices in agreement with Canada or with the companies distributing the current under contract. Moreover, the Federal Power Commission may charge 25 cents annually per installed horsepower as a license fee, a total of $275,000 a year for New York's half of the current. Amortization regulations might either prevent carrying out of the state's 50-year amortization program or reduce the income below requisite minimum. And, finally, at the end of a 50-year license period when amortization of the investment is complete, the federal government could take over the development without paying New York one cent.

Constitutionality of federal act disputed

The members of the St. Lawrence commission's legal staff hold that the federal water-power act is unconstitutional, being an assertion of federal control over water power instead of navigation. It is suggested that the difficulties may be met in one of three ways—by legal challenge of the act's constitutionality, which would require preparation of an issue which the Supreme Court would consider justiciable); by obtaining special congressional action exempting the St. Lawrence development from the general provisions of the act, so far as they are obnoxious, or by obtaining a license, trusting that the Federal Power Commission will not enforce the undesirable sections against a public project, and if such enforcement is attempted carrying the issue to the Supreme Court.

The Power Authority must choose. It cannot sell bonds without a Federal Power Commission license. No

bankers or investors would consider such bonds for purchase. If the third course is chosen, the act creating the Power Authority definitely forbids it to waive any rights of the state; the Federal Power Commission must decide whether it can issue a license to a body legally incapable of accepting it without reservations.

Having obtained War Department approval for the engineering plans, which should be easy, since the board which drafted them was headed by the late Lieut.-Gen. Edgar Jadwin, former chief of army engineers, and having received a license from the Federal Power Commission or exemption from Congress, the trustees must persuade the national administration to make the necessary international agreements with Canada.

Treaty with Canada a later step

The international section of the St. Lawrence comes within the purview of the boundary waters treaty of 1909 with Canada, which set up an International Joint Commission on the St. Lawrence. The necessary international sanctions may be obtained through treaty with Canada, by concurrent or reciprocal legislation by Congress and the Canadian Parliament, or by approval of the International Joint Commission. Any of these presupposes agreement within each country and between the two countries on every essential phase. Only a treaty, however, will permit the relocation of the international boundary contemplated by the New York engineering plans, which locate the dam and both power houses on what is now American territory. The line must be moved a bit to the southward and westward to place the Canadian power house on Canadian soil.

The New York trustees first must bring the federal administration into accord with their plans, and then use federal agencies for dealings with Canada. This reconciliation of national and state interests may prove difficult. The attitudes of the administration and of Congress depend upon many economic and political factors, of which the most important is the demand of the politically turbulent West that the St. Lawrence be developed for navigation.

Navigation still complicates the problem

The Middle West states and New England are anxious that the river be opened as a deep waterway for ocean-going vessels from Montreal to the Great Lakes. The most active proponent of such a waterway is the Great Lakes-St. Lawrence Tidewater Association, which claims to represent 23 states and which numbers among its directors such men as Henry J. Allen of Kansas, John Hamill of Iowa, Arthur J. Weaver of Nebraska and George F. Shafer of North Dakota. The Midwestern states, particularly those of the grain and ore belts, are hopeful of making their lake cities into seaports. Their visions of the future, and the needs upon which those visions are based, were summarized recently by Rielle Thomson of the Beauharnois Power Corporation:

"The demand for and the importance of the waterways lies in a unique experiment which America is now carrying on. It consists of an endeavor to build up and maintain a highly industrialized and complex civilization 1,000 miles from the sea. This is an inland empire embracing more than 30 states. It is bounded, roughly, by the Rockies on the west, the Alleghenies on the east, Canada on the north and by a line running east and west about 300 miles to the south of St. Louis.

"This is the area in which would be felt the benefits of the low-cost ocean freight rates available from what are now merely lake ports. Both the United States and Canada have western grain growers who are tremendously handicapped. They are by far the largest producers of wheat in the world, yet they are 1,000 miles from the sea. The wheat-producing and exporting areas of Argentina, India, Australia and Russia are located virtually on seaboard."

Former Governor W. L. Harding of Iowa said recently that the welfare of Midwestern agriculture depends upon development of a St. Lawrence deep waterway, which would halve the cost of shipping grain from Iowa to Liverpool and would increase the revenues of Iowa farmers by some $35,000,000 a year. Other grain belt states feel as strongly as Iowa on the subject.

East also has an interest

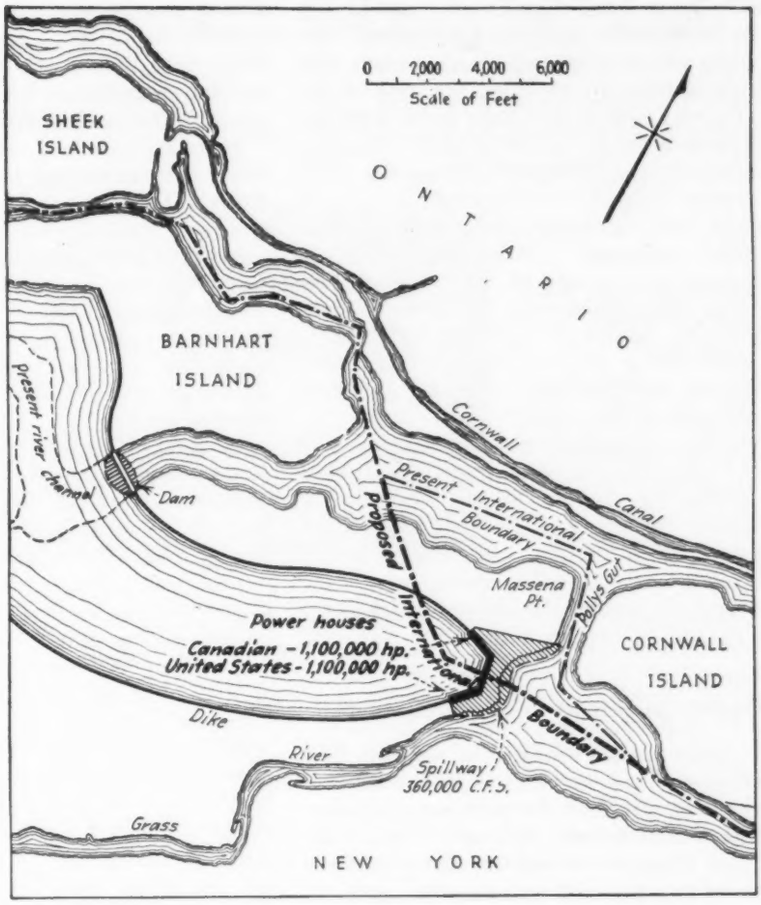
New England also considers the waterway program of more importance than New York's power needs. That concentrated industrial section argues that a St. Lawrence waterway would decrease freight costs on both incoming raw material and outgoing manufactured goods and would cut considerably the cost of the 80 per cent of its foodstuffs which is imported. Some New England states hope to tie a Lake Champlain waterway in with the St. Lawrence route.

The works which New York proposes to build for power would go far toward the cost of canalization, and to that extent the power project would aid the Midwestern-New England drive for a waterway. But this is overweighed by a more important consideration. If New York develops the power for its own use and the United States the waterway, either tolls must be charged or the waterway will be a drain on the public treasury, both for building and for operation. Waterway protagonists contend that the United States should develop both navigation and power, selling the current to amortize the construction costs of both and to finance operation

Proposed Basis for Division of St. Lawrence Canalization Costs Between Canada and the United States

Canada		
Present Works:		
St. Lawrence ship channel	$30,000,000	
St. Lawrence and Welland Canals	50,000,000	
Lock at Sault Ste. Marie, Ont.	5,560,000	$85,560,000
Proposed Works:		
Welland ship canal	$115,600,000	
National section, St. Lawrence shipway, 27-ft. navigation and development of 949,300 hp.	199,670,000	315,270,000
Total for Canada		$400,830,000
United States		
Present Works:		
Dredging St. Clair and Detroit Rivers	$17,636,000	
Locks at Sault Ste. Marie, Mich.	26,300,000	$43,836,000
Proposed Works:		
International section St. Lawrence shipway, 27-ft. navigation and initial development of 597 hp.	182,157,000	
To complete development—additional power 1,602,000 hp.	92,090,000	
Upper lake channels to 27 ft.	65,100,000	$339,347,000
Total for United States		$383,183,000

Offered by Premier W. L. MacKenzie King in 1928 and accepted by Secretary of State Frank B. Kellogg as an "acceptable basis for negotiation."



International boundary shift required to permit Canadian plant on Canadian soil

of the waterway. If New York's Power Authority gets so far as to seek administration aid in dealing with Canada it may meet with one of several receptions, none of which would be particularly helpful:

1. The present federal administration, which is not in sympathy with Roosevelt's plans for public transmission and distribution facilities, might easily involve the New York program in the whole tangle of waterways controversy, delay War Department approval and stand on the letter of the federal water-power act. Thus it might strengthen itself in the unruly Middle West by placing the waterways needs of that section above the power program of a potential Democratic presidential candidate.

2. The administration and Congress might insist that the income from power is necessary to finance waterway development, that the two should be developed simultaneously by the federal government, and then go ahead with plans for federal development. Even if New York went into the courts and won eventually, any development would be postponed indefinitely.

3. The federal government might give its approval and aid on condition that New York should construct also the navigational features and provide power for their operation. The additional capital cost would exceed $50,000,000, adding about a third to the generating cost of electricity per horsepower.

Canada has a diversity of interests

Further complications arise when and if the New York agency arrives at an agreement with the Washington government and undertakes negotiations with Canada. The issues in that country are quite similar to those in ours, but have not been carried so far toward clarification.

There is strong sentiment in many sections of Canada for waterway development. The Ontario Liberal convention, for instance, indorsed it heartily last December. Premier Richard B. Bennett of the Dominion favors it. Both political parties are pledged to push the canalization to completion, and this was promised in the speech from the throne when Parliament convened in March. The Canadian west seeks a deep waterway as far as Fort William, near where the northern shore of Lake Superior enters Minnesota, to enable direct shipment of Canadian wheat to Europe. Ontario is eager for development of the power, for which it will have need by the time it is available.

So far, however, the important province of Quebec has stood in the way, and the maritime province of Nova Scotia has stood in opposition because of fear that canalization would interfere with the business of its chief seaport, Halifax. One close to the Canadian government told the writer recently that Quebec's opposition is one of the big deterrents to quick action. Montreal and Quebec do not wish to risk surrendering their supremacy as inland ports to Duluth, Chicago, Detroit, Cleveland, Buffalo, Rochester, Oswego, Toledo and Milwaukee. Nor is Quebec eager to aid its rival province, Ontario, to build up its publicly operated power resources.

A greater difficulty may prove to be that of convincing Canadian engineers that the American plan for one dam is sound, even though it cuts millions of dollars from construction costs. Thus far they have insisted upon two dams. If General Jadwin had lived, the confidence placed in him by Canadians would have been of inestimable benefit to New York. There is nobody who can quite fill his place.

When Frank E. Kellogg was Secretary of State and

W. L. MacKenzie King was Premier of Canada the two arrived at an "acceptable basis of negotiations" for division of the costs of canalization. Each nation was to assume the entire burden of specified portions of the work, so that in the end each would have spent approximately the same amount on the entire project. Canada, for example, spent more than $100,000,000 on the Welland ship canal around Niagara Falls, entirely in Canada but useful to United States shipping, and it wanted credit for this in the final settlement. So the entire cost of developing navigation and power in the International Rapids sections was allocated tentatively to the United States. This cost was placed at $274,247,000, but is reduced in the engineering plans of the St. Lawrence Power Commission to $220,000,000. Canada would be entitled to half the power developed.

It is doubtful if any Canadian agency would care to assume half the cost of developing the International Rapids section unless the United States took over a corresponding outlay elsewhere. But all alternative projects are entirely within Canada, where perhaps this country would hesitate about spending its money. New York is not prepared to shoulder the entire $220,000,000 cost of navigation and power in return for half the power.

How shall Ontario participate in the enterprise?

Within Canada there are questions to be settled. The section to be developed borders Ontario. It is understood that Canadian law gives to the provinces jurisdiction over navigable waters flowing through or bounding them. Supposedly, Ontario would be the Canadian agency in the development. But when the Canadian Supreme Court was asked for an advisory opinion on the respective rights of dominion and province, it declined to give a categorical answer because the question was too hypothetical. And if Ontario is the agency of Canada, the method of co-operation with New York must be worked out. Will the Power Authority be modified into a joint international body, or will Canada select a separate group, perhaps the Hydro-Electric Power Commission of Ontario, to act co-operatively with New York?

All these major questions must have concrete, final answers effectuated with the necessary legislation on both sides of the international line and the necessary treaties, licenses, contracts, etc., before the Power Authority has the right to sell a first issue of bonds to finance actual work. Meanwhile, it is far from certain that New York has determined finally her own internal policy.

If the new trustees and the representatives of power companies, notably the Niagara-Hudson Power Corporation, are able to agree upon a contract which the Governor will approve, the statutory prerequisite to issuance of bonds will have been met. Otherwise the trustees must seek legislative approval of an alternative plan for distribution of the power. Nobody doubts that this alternative plan will be for a state-owned, state-operated system of transmission and distribution, which will involve state credit and which, it is generally felt, will be economically unsound.

There is little possibility that the Legislature will approve an issue of anywhere from $200,000,000 to $500,000,000 or more in bonds for such a purpose. Refusal to do so will leave the St. Lawrence power issue almost exactly where it was before the fact-finding commission began work last September, with every probability that before the state can act the United States will have reached an accord with Canada and will use the power to finance waterway construction and operation.

It appears, indeed, that actual work on the St. Lawrence is more remote today than when the St. Lawrence Power Development Commission presented its report to the New York Legislature last January. It was anticipated then that a minimum of one year would be required for preliminaries, and a minimum of five more years for construction before water could be turned into the turbines. Today the time for preliminaries must be estimated at nearer five years than one, and there is reason to fear that New York may never carry out the development.

Governor Franklin D. Roosevelt found it undesirable to appoint to the Power Authority the men who, as commissioners, had gone thoroughly into the subject and had all its intricacies at their finger tips. They had put in six months of the most arduous study with the cordial co-operation of every party at interest. But Governor Roosevelt felt, he told friends, that the old commissioners might wear kid gloves in negotiations with utility representatives, and he preferred that the iron hand should wear brass knuckles.

So he appointed five new men, of whom three, estimable gentlemen personally and completely honest and sincere, are generally considered radicals and corporation baiters. A fourth is known for his hostility to the Niagara-Hudson Corporation, natural distributor of the power for geographical reasons, and the fifth is a nonentity in power matters. Not one has a single outside contact valuable in performance of the particular task for which he was chosen.

New board must learn what old knew

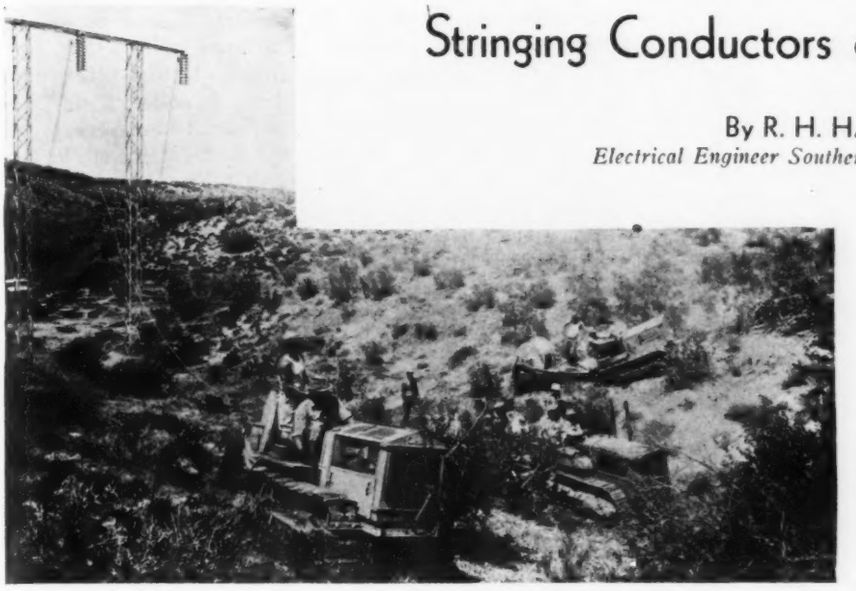
What has taken place so far is merely that New York State has adopted a policy of developing the Long Sault Rapids through a public corporation and distributing the resulting current, if possible, by contract with the private companies operating in the state. None of the conflicting interests have been reconciled. The St. Lawrence Power Development Commission had made personal contacts which promised to smooth the way to the necessary settlements with the United States, Canada, the power companies, etc. When the new trustees have devoted six or eight months to learning what the old commissioners know already they will be in position to begin their attack upon the succeeding obstacles.

If Governor Roosevelt had seen fit to reappoint as trustees his investigating commissioners there would be a probability that none of the issues raised here would prove too serious. The old commission had friendly first-hand contacts with the federal administration, with Canada, with banking circles who would float the bonds, with the power companies with which contracts would be negotiated.

The new board has none of these contacts. Its qualifications are an intense public spirit, a publicly admitted love for a good fight and a high average of general intelligence. Under such circumstances, the development of hydro-electric power on the St. Lawrence is not a thing of tomorrow, or of next month or even next year. It will be surprising if anything is done in a decade.

Stringing Conductors on Hoover Dam Line

By R. H. HALPENNY
Electrical Engineer Southern Sierras Power Company



Stringing three conductors at same time on Hoover Dam line

Tractors and pneumatic-tired trailers pay out conductors in rugged desert country. H-towers permit laying center line directly under insulators without re-handling.

Specially constructed cable reel trailers were used in stringing the conductors on the 225-mile, 132-kv. Hoover Dam line,* which was erected in 225 days. These two-wheel trailers were equipped with pneumatic tires and designed so that reels could be conveniently loaded. Each pay-out reel was drawn by a tractor, which made it possible to use this equipment in very rough section of the country. The design of the H-structure made it possible for the three tractors to lay the conductors directly in position under the towers without special handling of the center conductor, required in the case of A-type towers.

As the conductor was paid out it was placed in dollies suspended from the crossarms, and by the time the reels were emptied the conductors were in position for sagging in. The tractors were then made use of for pulling up the conductors to the proper tension. After this operation the clipping-in crew removed the cable from the dollies, placed the armor rods in position and fastened the cable in the clamps. In spite of the fact that tractor haulage of the reels made it possible to lay out most of the cable in this manner, there were numerous sections where the extremely rough character of the right-of-way necessitated a great deal of hand work in paying out the conductors.

For use in the operation of power line and stations an independent telephone circuit was included in the construction program. This circuit, consisting of copper conductors supported on butt-treated cedar poles, was so located as to be accessible for patrol use.

"Electrical World," July 4, page 31, and July 18, page 114.

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Electricity Persuades Lilies to Bloom

Among 1,500 lilies that a Detroit florist was growing for the Easter market this year he was pained to discover that about 400 apparently would not bloom until probably ten days after the holiday. Since they could be sold at $2 apiece retail a few days before Easter, but would bring very much less only one day after, the florist gave thought to his problem. He tried all the usual forcing methods, such as increased heat and humidity, but the 400 lilies responded only languidly, not fast enough for his purpose. Being a resourceful person, he went to the Detroit Edison Company and inquired if it had anything that would make lilies "lil." It had.

Four 1,000-watt lamps in R.L.M. dome reflectors were hung 6 ft. above the bench in the greenhouse on 4-ft. centers. The wiring was done with non-metallic sheath cable at a cost of $30. The lamps were operated from 2 a.m. to 6 a.m. for twenty days, using a total of 295 kw.-hr., which cost the florist about $8. He rotated the backward plants under the light so that all were forced according to their degree of lateness behind the normal ones. And when Easter arrived he had the full 1,500 lilies blooming and ready for sale, instead of only 1,100 as he had feared.

Remote-Controlled Hydro Station

Remote automatic controls for hydro stations are used very frequently. The accompanying diagram shows the essential features of the remote-control system developed and applied by the General Control Corporation. Briefly, the operation is as follows:

When the control switch is closed the master relay is energized provided all of the protective relays are closed. With the closing of the master relay the governor solenoid is energized and opens the gates, permitting the waterwheel to start revolving.

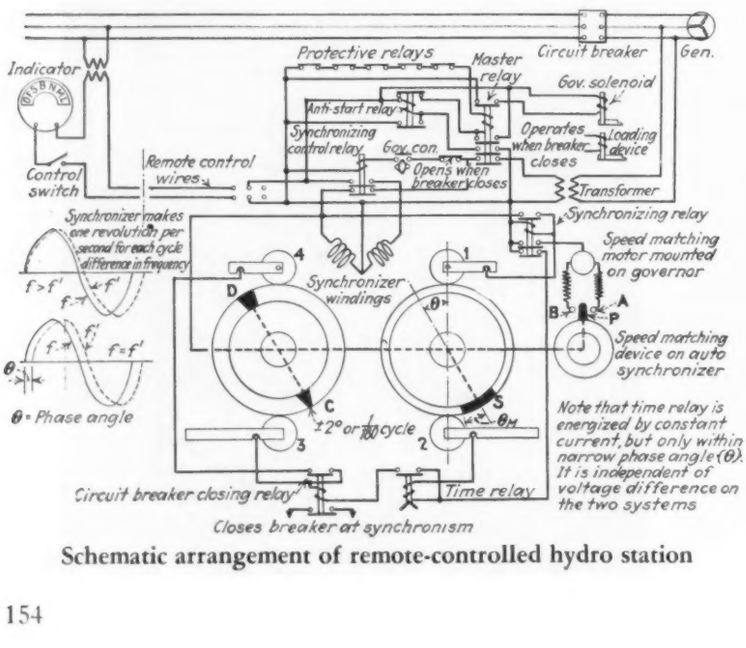
When the generator is producing about 85 per cent of its normal voltage and has gained almost synchronous speed centrifugal force causes the closing of the governor contact. This causes the closing of the synchronizing control relay, which places one winding of the automatic synchronizer under the influence of the generator frequency and the other winding under the influence of the main line frequency.

When the synchronizer begins to revolve, one way or the other, depending upon which frequence is high, the contact S touches roller 1 and this energizes the synchronizing relay, which permits the speed-matching device and other synchronizing equipment to get into action.

If the synchronizer revolves in a clockwise manner the contact P will touch the pin A, energizing one winding on the speed-matching motor as shown, causing it to revolve in a direction which will decrease the tension on the springs of the flyballs on the governor. If the generator is running too slowly the synchronizer will revolve in a counter-clockwise direction and the contact P will strike the pin B, causing the energizing of the other field winding of the speed-matching motor. This contact P is carried in the direction of rotation by friction, but this is not great enough to interfere in any way with the action of the synchronizer. The speed of the incoming generator is thereby brought to exactly the same value as the main line, and the synchronizer will come to rest. If the frequencies are the same, but there is a difference in phase, the contacts C and D will not assume a vertical position. The angle which they form with the vertical is the phase angle. If that phase angle is small enough contact S will touch roller 2, and if it remains in contact long enough (about one second), the time relay is closed and then the first time that the contact C touches roller 3 the circuit breaker is closed.

With the closing of the circuit breaker an auxiliary contact mounted on it opens, breaking the synchronizing control relay circuit, which, of course, disconnects the synchronizer and the speed-matching device. With the closing of the breaker, however, another auxiliary contact on the breaker closes and energizes the solenoid of our loading device, which automatically adjusts the governor so that the generator will take load.

During all this time the operator at the remote point sees before him on an indicating instrument just what is going on at the automatic station.


Indicator
Protective relays
Master relay
Circuit breaker
Gen.
Gov. solenoid
Anti-start relay
Synchronizing control relay
Gov. con.
Operates when breaker closes
Loading device
Opens when breaker closes
Transformer
Remote control wires
Control switch
Synchronizer makes one revolution per second for each cycle difference in frequency
Synchronizing relay
Speed matching motor mounted on governor
Synchronizer windings
Speed matching device on auto synchronizer
θ = Phase angle
±2° or 1/100 cycle
Note that time relay is energized by constant current, but only within narrow phase angle (θ). It is independent of voltage difference on the two systems
Circuit breaker closing relay
Time relay
Closes breaker at synchronism

Schematic arrangement of remote-controlled hydro station

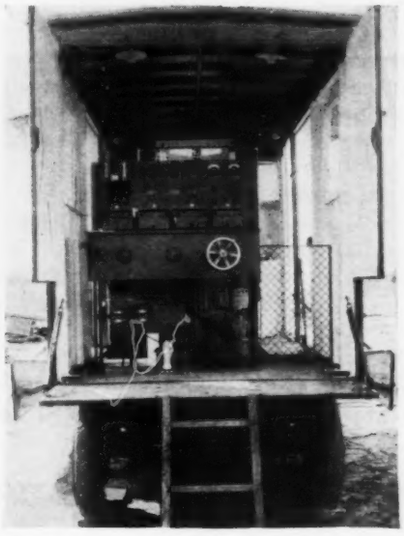
Kenetron Trailer Has Many Improvements

By E. F. NEUZEL

Columbia Engineering & Management Corporation, Cincinnati, Ohio

The electrical test department of the Union Gas & Electric Company has recently built a portable 150-kv., two-tube kenetron set which incorporates drop frame construction with many new mechanical and electrical safeguards. The equipment was purchased from the General Electric Company and assembled in a trailer made locally by Cincinnati concerns.

The appearance of the trailer and the layout of the equipment are shown on the opposite page, but a feature not apparent in the illustrations is that of safety in operation. Five electrical interlocks are all arranged in series with the under-voltage release coil on the main air circuit breaker. One interlock is controlled by a foot pedal under the benchboard and must be kept closed by the operator's foot while the set is in operation. A second interlock is placed on a metal screen door which separates the operator's compartment from the high-voltage equipment. An interlock is also placed on each of the lower side panel sections and on the access door. All of these interlocks must be closed before the set can be operated. The high-voltage lead is protected by a grounding shield having a larger cross-section than the conductor, thus insuring an intact ground connection in case of a fault in the lead. This lead is brought out of the set through the upper hinged side panel and is supported by varnished cambric tape. The cases of all equipment are solidly grounded to a ground bus and to the body, which is connected to ground by means of flexible leads. Ample space is available for carrying tools, flexible power leads, safety gap, and other miscellaneous equipment, which are not built integral with the set.



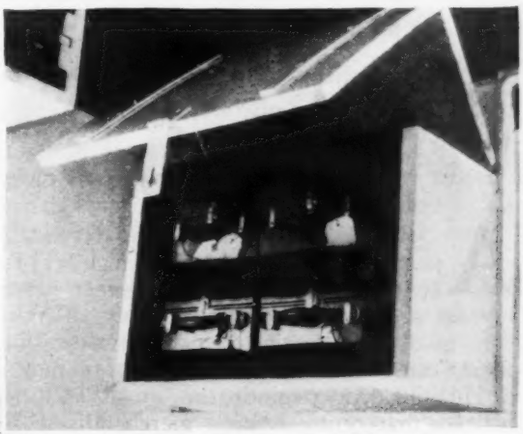
Ready for the road and operation

The chassis, which is of 3-ton capacity, is built with drop-frame construction in order to house the power transformer without excessive body height. The body is made of "metal wood," all the panels of which are electrically interconnected for grounding purposes. The windows are all shatterproof glass and are non-removable except for the front window, which provides for the entrance of the power leads in addition to serving as a ventilator. All doors and hinged panels are locked from the inside. The forward access door on the right side is the only door which is arranged for locking from the outside.

The operating benchboard is located near the end of the trailer so that when the rear doors are opened and the rear panel is dropped adequate light and standing room are provided for the operator. The voltage regulator is mounted directly in back of the benchboard with the control handle brought out to an accessible position under the benchboard table. The power transformer is directly back of the regulator in the drop frame section.

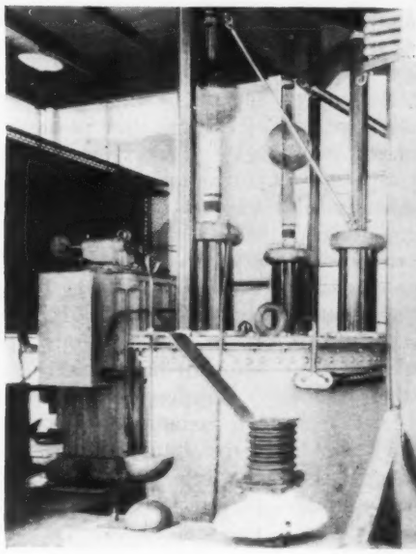
No jolt or jar can harm them

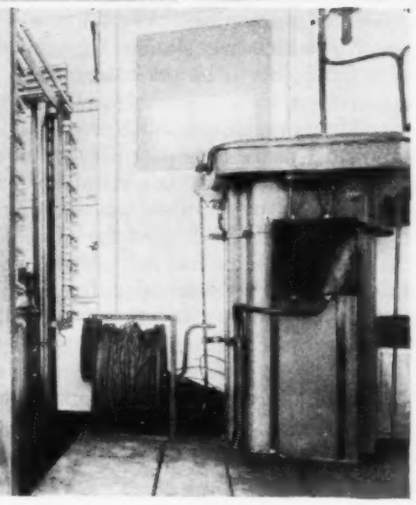
Sensitive portable milliammeters and crest voltmeters are carried in a meter box, lined with 2-in. sponge rubber, directly above tube bins. Separators between and on top of meters are loosely placed in position.

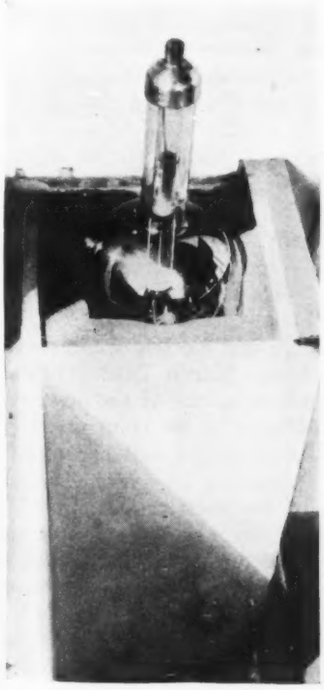


Side doors are opened

At left, below, is regulator behind operating panel, then 150-kv. transformer with kenetron tubes above and calibrating gap in front. At right, below, is a 50-kva. 2,300/230-volt transformer for use at locations where only primary voltage is available.







Tubes are carried in the "burning" position

The tube bins are lined with 2-in. sponge rubber which is slightly compressed when the tubes are in place. The top of the bins is covered with a sliding lid arranged for locking.

73 Kw.-Hr. per Domestic Customer Added in 52 Days

Sale of 2,633 electric ranges and 573 water heaters adds 8,000,000 kw.-hr. yearly.

Water heaters operated on fifteen-hour charging cycle.

Customer pays $1.11 per month plus 1.11 cents per kilowatt-hour.

Concentrated on range users.

Data that helped salesmen.

Prices included hot-water pipe insulation.

Inducement to buy range-water-heater combination.

Advertising included newspapers, broadsides, posters, etc.

By CHARLES A. COLLIER
Vice-President Georgia Power Company

A "REDCAP" in the Atlanta terminal was unexpectedly commissioned to "pinch hit" for the regular train caller. In an altogether stentorian voice, he said something like this: "Enny yo' fokes over dar dat's goin' ennywhar better get yo' valises out on de flatform, 'cause we's gotta lotta trains goin' mos' everwhar!"

This incident reminds me, or at least leads me to believe, that central-station merchandising is often the victim of similar indirection. We know already there is some place for which we should be headed; we know there is a definite job to be done, a definite objective to be reached, and yet we are prone to take the longest way 'round in order to reach this objective.

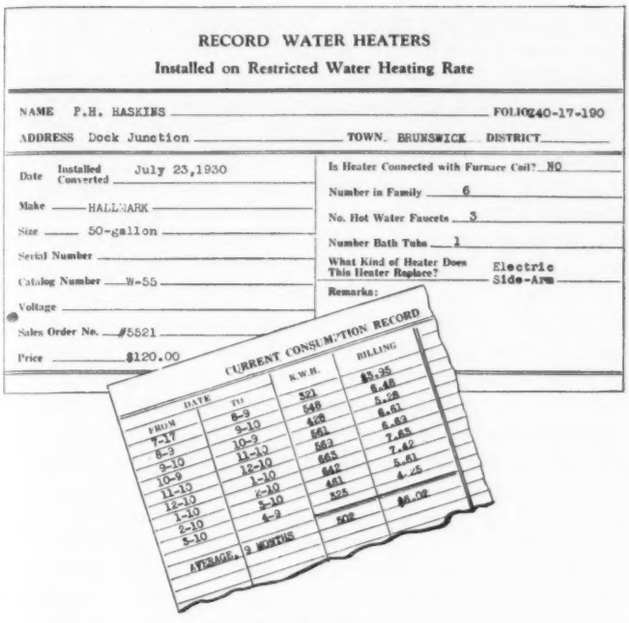
Merchandise departments of utilities have always set up their merchandise sales bogies at so many dollars' worth of appliances per annum. Now, there can be no criticism of such plans if they at the same time consider the merchandising job as one not only closely associated with additional kilowatt-hour sales, but also as an inseparable part of the job. Sometimes I wish that, from the very first, power companies had set up their merchandise quotas as to how many kilowatt-hours per year should be developed, rather than how many dollars' worth of ranges, refrigerators, water heaters, toasters and flat irons should be sold. On the other hand, to take a stand so apparently selfish would, in the real analysis, defeat its character. To assume that we should sell kilowatt-hours without reference to what they can and will do for the customer in electric cookery, in electric refrigeration, in electric water heating, through the tangible use of the range, the refrigerator and the water heater is a dangerous and circuitous route to chart for ourselves. As the purpose of power company merchandising is, in the ultimate, that of increasing the use and sale of electrical energy and that of increasing net income which comes from its sale, we cannot afford to lose sight of the co-ordinate importance of our merchandising activities and our kilowatt-hour sales activities. To keep unwarped our conceptions of sound commercial principles in appliance selling we must push our heads up through and out of the clouds, giving due consideration to the over-all aspects of the merchandising job.

Further considerations of what we are pleased to call the "over-all picture" should include both a co-operative spirit and a co-operative action which would encourage merchandising by other electrical outlets, rather than a type of activity on the part of the utility which would tend to stifle the initiative of other outlets.

The Georgia Power Company, along with other central stations in the country, has come to the realization that its index of kilowatt-hour sales is, after all, its finest index of merchandising and commercial activities. That is why the recent electric range and electric water heater sales campaign conducted from March 2 to April 25 stands out, in our own estimation, as one of the best new-business campaigns ever concluded by the company.

During this 52-day sale 2,633 ranges and 573 electric water heaters were sold. Assuming an average annual consumption of 2,000 kw.-hr. for each range and 4,800 kw.-hr. for each water heater, we arrive at a new and additional annual sales figure of 8,016,400 kw.-hr. This estimated total divided by 110,287 residential customers (March 31, 1931) gives us, as a result of this one activity, an average of 72.6 kw.-hr. per residential customer to be added to our present annual index of residential kilowatt-hour sales.

Indulging in a bit of projection, we discover that if we assume the life of each of the appliances sold to be a minimum of ten years, we have assured ourselves of the sale of 80,164,000 kw.-hr. over the next ten-year period, or, if you please, 726 kw.-hr. per present residential meter!



RECORD WATER HEATERS

Installed on Restricted Water Heating Rate

NAME P.H. HASKINS FOLIO 240-17-190

ADDRESS Dock Junction TOWN. BRUNSWICK DISTRICT

Date Installed / Converted July 23,1930

Make HALLMARK

Size 50-gallon

Serial Number

Catalog Number W-55

Voltage

Sales Order No. #5521

Price $120.00

Is Heater Connected with Furnace Coil? NO

Number in Family 6

No. Hot Water Faucets 3

Number Bath Tubs 1

What Kind of Heater Does This Heater Replace? Electric Side-Arm

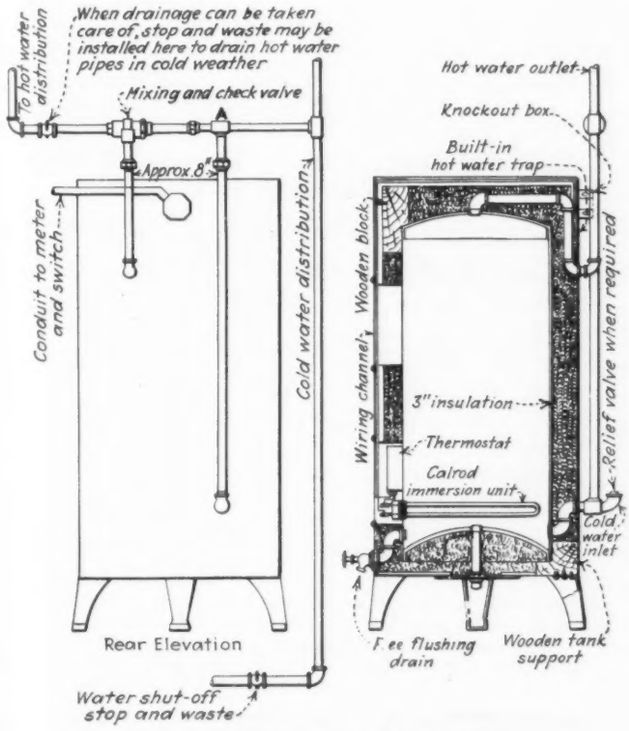
Remarks:

CURRENT CONSUMPTION RECORD

DATE FROM	DATE TO	K.W.H.	BILLING
7-17	8-9	521	$5.35
8-9	9-10	548	5.48
9-10	10-9	428	5.28
10-9	11-10	561	5.61
11-10	12-10	583	5.83
12-10	1-10	665	7.65
1-10	2-10	642	7.42
2-10	3-10	461	5.61
3-10	4-9	325	4.25
AVERAGE 3 MONTHS		502	$6.02

Form of office records kept

Information for transfer to these cards is furnished the Atlanta office of the Georgia Power Company on a special form filled in by each district manager as water heaters are sold and installed. Monthly consumptions and net bills are posted on the reverse side by the consumers' bookkeeping department. The data serve, or at least will serve as time goes on, as definite information for salesmen in estimating hot-water consumption in Georgia territory.


When drainage can be taken care of, stop and waste may be installed here to drain hot water pipes in cold weather
To hot water distribution
Mixing and check valve
Approx. 8"
Conduit to meter and switch
Cold water distribution
Hot water outlet
Knockout box
Built-in hot water trap
Wooden block
Wiring channel
3" insulation
Thermostat
Calrod immersion unit
Relief valve when required
Cold water inlet
Rear Elevation
Tee flushing drain
Wooden tank support
Water shut-off stop and waste

Information for plumbers making installations involving mixing and check valves

Hot-water pipe should be insulated from heater as far as possible without tearing up woodwork. Where necessary to drain house piping in cold weather extra precautions must be taken to prevent trapping and/or draining tank. If customer has tank with furnace coil it may be connected in place of cold water supply.

Due to the fact that up until very recent months there has been little publicity given to the operation of "restricted" or "off-peak" water-heating rates and their effect upon the sale of electric water heaters, it may be of interest to outline some of the problems with which the Georgia Power Company was faced when first it formally announced such a rate in the fall of 1930.

An analysis of the cost to operate water heaters indicates that the high-wattage heater cannot be generally operated at a cost which will meet competition on the 2-cent block of the Georgia Power Company's residential rate; the low-wattage storage type heater does not justify a rate which will meet natural gas competition; the off-peak heater is the best answer to our problem of meeting gas competition, and will make it profitable to supply hot water service at a rate of $1 net service charge, plus 1 cent (net) per kilowatt-hour on a fifteen-hour charging time-cycle.

A matter of importance, of course, was the determination of the number of hours' charging time which would be necessary to furnish an adequate hot water supply. This first point was one in which the customer's interest had to be taken into account. From the company's standpoint it was important to consider the possible number of hours which could, over a 24-hour period, be made available to customers without establishing peaks on the load curve. Studies of statistical and graphic calculations led to a maximum of fifteen hours' charging time, divided into two periods as follows:

Table I—Charging Time for Water Heaters

On	Off	No. Hours
8:00 p.m.	7:30 a.m.	11:30
1:00 p.m.	4:30 p.m.	3:30
Total hours per day.....		15:00

Studies were made of load curves of various distribution systems and actual periods of charging time were, in some instances, rearranged to avoid undesirable peaks. The number of hours, however, totals fifteen in all cases, except Brunswick, Ga., where an additional hour is allowed.

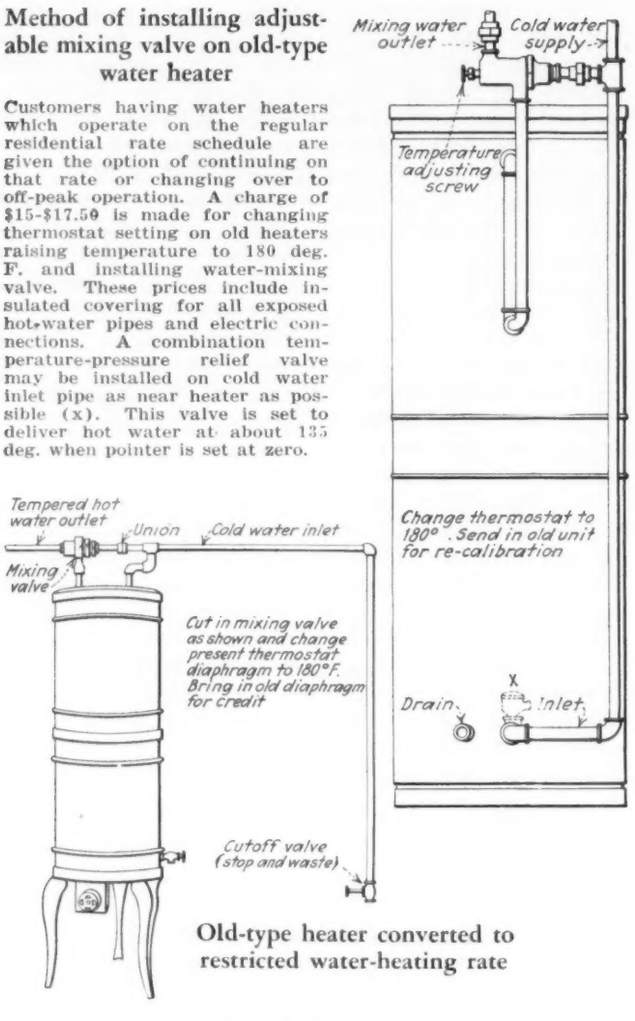
In line with the Georgia Power Company's established practice of thoroughly testing all electric appliances which it sells, the newly designed water heater operating under the new restricted rate was given a four months' trial in the Brunswick district, which serves approximately 1,900 residential customers. Closer observation of the rate's effect on the load was made possible because the Brunswick service comes from an isolated generating plant. Accurate records were kept on all heaters sold in Brunswick under the new rate—about 30 in number—during the trial period. Almost without exception the service rendered by these heaters proved satisfactory from both the standpoint of the customer and of the company. After these tests the rate was made applicable to all territory served by the Georgia Power Company in November, 1930.

The rate schedule as promulgated by the Georgia Public Service Commission read as follows:

Restricted service for residential or commercial water heating only. The supply of service under this schedule shall be limited to operating periods aggregating not more than fifteen hours a day, which period may at the option of the company be further restricted or extended, the extent of such restriction or extension to be determined solely by the company and to be subject to variation at any time or from time to time and from locality to locality, as in the opinion of the company conditions may war-

Method of installing adjustable mixing valve on old-type water heater

Customers having water heaters which operate on the regular residential rate schedule are given the option of continuing on that rate or changing over to off-peak operation. A charge of $15-$17.50 is made for changing thermostat setting on old heaters raising temperature to 180 deg. F. and installing water-mixing valve. These prices include insulated covering for all exposed hot-water pipes and electric connections. A combination temperature-pressure relief valve may be installed on cold water inlet pipe as near heater as possible (x). This valve is set to deliver hot water at about 135 deg. when pointer is set at zero.


Mixing water outlet
Cold water supply
Temperature adjusting screw
Change thermostat to 180°. Send in old unit for re-calibration
Tempered hot water outlet
Union
Cold water inlet
Mixing valve
Cut in mixing valve as shown and change present thermostat diaphragm to 180°F. Bring in old diaphragm for credit
Drain
X
Inlet
Cutoff valve (stop and waste)

Old-type heater converted to restricted water-heating rate

rant. Service under this schedule is available only for water heaters of not more than 3,000-watt capacity, equipped by the company with suitable device for automatically restricting supply of current to those hours which the company may designate in the case of each individual heater. This service shall be supplied through a separate meter and no other appliance shall be connected to this meter.

Rate: Service charge, $1.11 per month per meter. Plus an energy charge of 1.11 cents per kilowatt-hour per month.

Minimum Monthly Charge: The Service Charge.

Prompt Payment Discount: All bills paid within ten days from presentation are subject to a discount of 10 per cent.

Contract Period: One year.

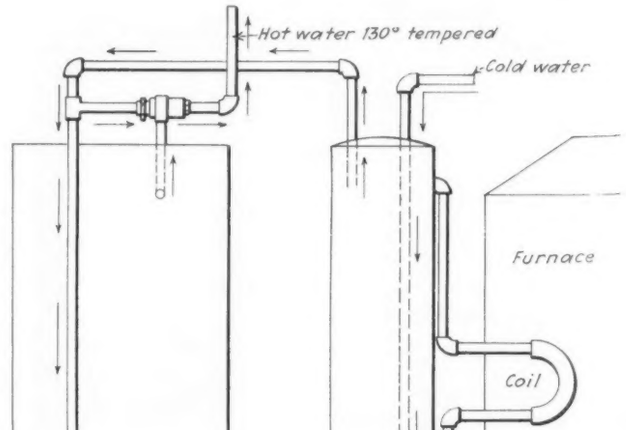
Announcement of the new and lower water-heating rate was made in a series of six advertisements which appeared in thirteen daily newspapers in Georgia. In the belief that present electric range owners would be the most likely prospects for the new water heater, both sales and advertising effort were concentrated upon them. To all range owners, some 12,000 in number, was sent a series of four direct-mail advertising pieces. These broadsides were designed to sell the new rate and the general desirability of having an adequate, automatic hot water supply in the home. During the introductory two-weeks sale 244 heaters were sold.

Prior to the formal announcement of the rate and before the introductory sales campaign special meetings designed to sell the new rate and its operation to our salespeople were held in various divisions in the state. These meetings were, in effect, water-heating schools, in which salesmen were trained in the application of the rate to individual needs. "Estimated household use of hot water for a family of five"; "conditions affecting the individual monthly operating costs"; "how to estimate hot water and kilowatt-hour consumption"; "maximum service obtainable from specific sizes and wattages of heaters"; "covering of hot water pipes"; "conversion of old type heaters to new type rate and operation"; "installation of heater and water-mixing valve"—these were subjects discussed at the meetings. In addition, each salesman was furnished with a handbook entitled "To Help You Sell Electric Water Heating." This handbook contained all the information any salesman would need in order to sell the new water heater.

The situation to be guarded against by the salesman was the selling of a heater too small in size to meet the requirements of his prospect. Therefore, he was urged to survey all the conditions which would determine the size of the heater or which would affect its operating costs. The questions which the salesman had to ask and had to have answered, either by the prospect or through his own observation, were: Is the customer a lavish or a moderate user of hot water? Is the piping unnecessarily large ? Is the piping to the kitchen too

Table II—Estimated Household Use of Hot Water for a Family of Five Persons

Uses	Estimated Quantity Daily (Gal.)	Suggested Temperature (Fahr.)	Number Gallons Hot and Cold Water in Mixture Hot 130 deg. F.	Cold 60 deg. F.
Hands and face	10	105	6.5	3.5
Dishes	8	130	8.0	....
Cleaning	5	120	4.0	1.0
Cooking	2	130	4.0	....
Bathing	40	100	23.0	17.0
Washing (clothes), weekly	30	130	30.0	....
Total	95 maximum 65 normal In containers		73.5 maximum 43.5 normal Through heater	



Heater in series with furnace tank

Indicates plumbing connections necessary for using customer's furnace tank in series with electric water heater. The furnace tank acts, usually, as a tempering tank for incoming cold water and permits more economical operation of the hot-water system.

Table III—Estimating Water and Kilowatt-Hour Consumption

A W-50 (Hotpoint) heater with 25 ft. of insulated piping, delivering water at the faucet at an approximate temperature of 130 deg. F., with incoming cold water at 60 deg. F., will deliver 4.7 gal. per kilowatt-hour.
Average normal hot water consumption, 7 gal. per person per day.
Maximum hot water consumption, 15 gal. per person per day.

Table IV—Average Kilowatt-Hour Consumption and Bill for Families of Five

	Kw.-Hr. Per Family	Monthly Bill
***Cities,** bungalows	350–400	$4.50–$5.00
large houses	450–550	5.50– 6.50
†**Towns,** bungalows	300–375	4.00– 4.75
large houses	400–500	5.00– 6.00

* Cities—Atlanta, Augusta, Macon, Columbus, etc.
† Towns—Athens, Rome, Gainesville, Dublin, etc.

Table V—Average Kilowatt-Hour per Person per Month

	Persons Per Family	Kw.-Hr. Per Person
Cities	4 to 6	80
	2 to 4	100
Towns	4 to 6	75
	2 to 4	90

Table VI—Method of Figuring Maximum Bills

The maximum bill is controlled by the clock and the size of unit. Fifteen hours per day on the water-heating rate schedule will permit the following kilowatt-hour consumption:

Size of Unit (Kw.)	Kw.-Hr. Per Month	Monthly Bill
1.5 × 15 hours × 30 days	675	$7.75
2 × 15 hours × 30 days	900	10.00
3 × 15 hours × 30 days	1,350	14.50

Under maximum continuous operation a W-50 (Hotpoint) heater, 1,500 watts connected, will deliver 105 gal. per day, or 3,172 gal. per month.

Table VII—Standard Test Daily Draw-Off Schedule (Georgia Conditions)

W-50 (Hotpoint) 50-Gallon Plain Storage Water Heater

Room Temperature—75 deg. F. Cold Water Temperature—60 deg. F. Hot Water Tank Temperature—180 deg. F. Mixing Valve Delivers—130 deg. F.

	Gallons Per Day 130 Deg. F.	Days Per Month	Gallons Per Month 130 Deg.F.
Minimum day	28	12	336
Normal day	71	13.4	951
Maximum day	107	5	535
Total	59.9	30.4	1,822

4.7 gal. 130 deg. water per kilowatt-hour equals 389 kilowatt-hours to deliver 1,822 gal. per month.

Table VIII—It Pays to Cover Hot Water Pipes

This table shows the estimated savings* in kilowatt-hours per month by covering hot-water pipes with an approved insulation. Figures given are for 1-ft. lengths. Multiply by number of feet to get total amount for a given insulation. This table is based on water at 130 deg. F. in a room temperature of 70 deg. F.

Size of Pipe, In.	Weight in Pounds	Outside Area, Sq.Ft.	U.S. Gals. Contained	Lb. Water Contained	Kw.-Hr.*
¾	0.84	0.221	0.016	0.132	2.6
1	1.12	0.275	0.028	0.231	3.3
1¼	1.67	0.334	0.045	0.374	4.1

* Saving per month per foot length of pipe when covered with 1-in. insulation (vs. bare pipe).
The above figures represent conditions in the home where pipes are intermittently filled with hot water.

long, and is the general piping exposed to outside temperature conditions, and uninsulated? What portion of the total piping can be insulated? Is the family large or small? Is the laundry done on the place? How many bathrooms? Showers? Hot-water outlets?

Contained in the handbook was Table II.

As is almost always the case, the customer wants to know "How much does it cost to operate?" Tables III to VIII were used by the salesmen in answering such questions by properly classifying their prospects in one or the other of the groups indicated.

Due to the operation of the timing device installed with each heater it is impossible for it to operate more than the allotted fifteen hours. Due to the wattage of any particular heater it is impossible for it to use more than a maximum number of kilowatt-hours of electrical energy. These two factors enable the salesman to state that the customer's maximum bill will be no more than the figures shown in the last column of Table VI.

Assuming the conditions set forth in Table VII, it was found that this particular size of heater would deliver hot water totaling 1,822 gal. per month at a total estimated cost of $4.89, or approximately ¼ cent per gallon.

To make more efficient the operation of the water heater proper insulation of hot-water pipes was urged upon customers. Salesmen, likewise, had the advantages of pipe insulation impressed upon them at all water-heating conferences. So important was the matter of pipe covering that the prices of all heaters sold have included the cost of covering all exposed hot-water pipes in customers' homes. Table VIII shows the savings that come through adequate pipe covering.

Including heaters sold during the special 52-day sales campaign concluded on April 25, the total number of water heaters either definitely sold for restricted operation or changed over to restricted operation will be brought up to approximately 1,000 units. It is estimated that these heaters will consume 4,800,000 kw.-hr. per annum, with a consequent approximate revenue of $60,000.

Prices of heaters, including complete installation and the running of not more than 15 ft. of pipe, equipped with mixing valve delivering water at approximately 135 deg. F., were set up as follows:

—Tank Rating— Gal.	Watts	Installed Price
30	1,500	$130
50	1,500	149
50	2,000	149
100	2,000	210

To urge the purchase of both an electric range and an electric water heater at the same time a reduction of $10 in the price of the heater was extended on combination sales. Terms on the heater alone were $5 down, balance in 24 equal monthly installments. When range and water heater were purchased together the terms extended were $10 down for both, balance in 30 equal monthly installments.

An adequate sum was expended for advertising during the period from March 2 to April 25. Fourteen daily newspapers and 129 weekly newspapers were used for display advertisements. A series of four direct-mail broadsides was scheduled to go to some 12,000 electric range prospects; two mailings on water heaters were sent to some 14,000 electric range owners. A 30-day showing of 153 range posters was contracted for in 28

district and division office towns. The poster was especially designed for the Georgia Power Company. Store and window display material was effectively used.

Prizes offered to salesmen included suitably engraved wrist watches for sales supervisors and district managers in each of five classifications who attained greatest per cents of quota. Second-place prizes were suits of clothes, third-place prizes were dozens of shirts.

The campaign quota was set up at 3,000 units of ranges and water heaters. As previously mentioned, the number of units actually sold totaled 3,206, or 106.8 per cent of the quota. A 30-day sales campaign on electric water heaters alone is planned for the month of July. It is believed that by that time the company will have had enough heaters in operation for a time long enough to furnish first-hand data for more satisfactory promotion of the rate and the heater through which its service may be obtained.

We are hopeful that we will be "goin' somewhar" in particular in this business of obtaining new water-heating business. And all along the way we shall expect to learn more about it!

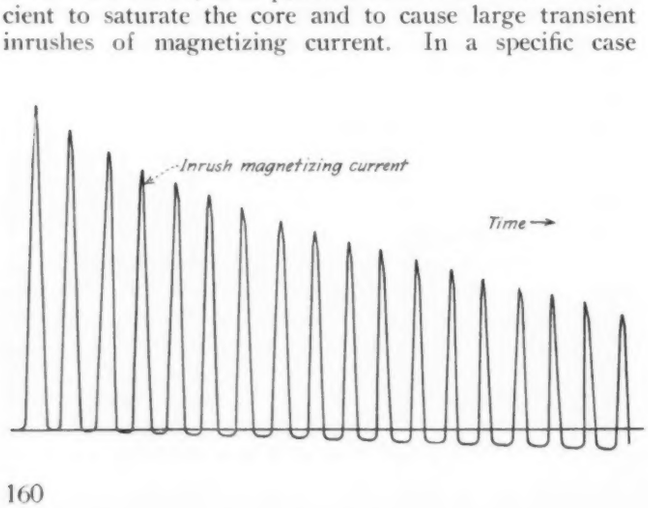
▼ ▼ ▼

Preventing False Operation of Differential Relays

By R. E. CORDRAY
Switchgear Department, General Electric Company, Philadelphia, Pa.

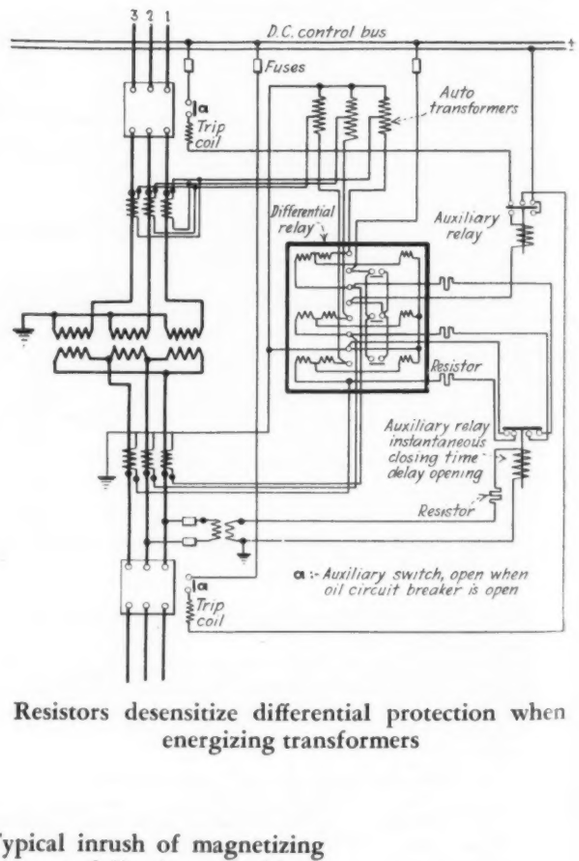
FALSE operation of the differential relays on its power transformers by the transient inrush of magnetizing current following switching is being prevented by the Carnegie Steel Company with an interesting improvement. The equipment was put into use after false operations had been repeatedly experienced and it has entirely eliminated them. Similar equipment is being used also by the Pennsylvania Water & Power Company and other companies.

Normal magnetizing currents of transformers, ranging from 2 to 10 per cent of the rated load current, impose no difficulty, as relays are never set for such critical sensitivity. However, during switching a transient inrush several times the rated load current may occur and thus cause false operation of the differential relays. The value of the initial magnetizing current with constant applied voltage depends upon the point on the voltage wave at which the circuit is closed and on the magnetization characteristics of the core iron. Even though the maximum flux density (260 per cent of normal) may never be reached, it is possible to attain densities sufficient to saturate the core and to cause large transient inrushes of magnetizing current. In a specific case

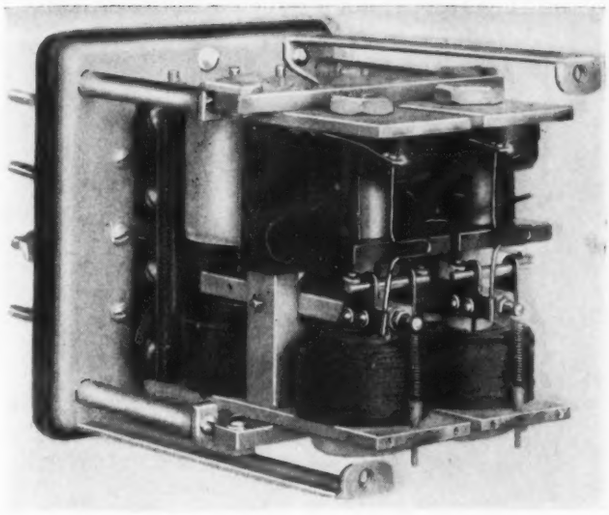


Typical inrush of magnetizing current following switching

Operating element desensitized during transient inrush of magnetizing current following switching



Resistors desensitize differential protection when energizing transformers



High-speed balanced beam relay

numerically analyzed in the "*Electric Journal*" (October, 1930, page 606, Fig. 12) a magnetizing current peak is shown in excess of ten times the peak value of the rated full-load current of the transformer.

Certain factors within a system may also alleviate or accentuate such transient inrushes of magnetizing current. Where the ratio of generator capacity to transformer capacity is relatively small, impedance relatively high and regulation poor the inrushes of magnetizing current are reduced. With the opposite condition the inrushes are more intense. Whenever transformers are operated at a higher voltage than their ratings the transient inrushes of magnetizing current during switching and the possibility of false operation of differential relays are very much increased.

Factors affecting settings

In most installations the transient inrush of magnetizing current does not reach excessive values, and for these a differential relay current setting of one-half rated load and a time delay of $\frac{1}{8}$ second are found to prevent false operation during switching. The half-load setting of the relay may not at first appear to be sufficiently sensitive, especially when compared with generator protection practice, but it must be considered that in generator faults the greatest damage is done by burning of the iron, which is very costly to replace compared with the windings, whereas in transformers the iron is not apt to be damaged and is far easier to replace if damaged. There is no material advantage in preventing the spread of a fault from a few turns to a whole coil section as the latter would be replaced in either event.

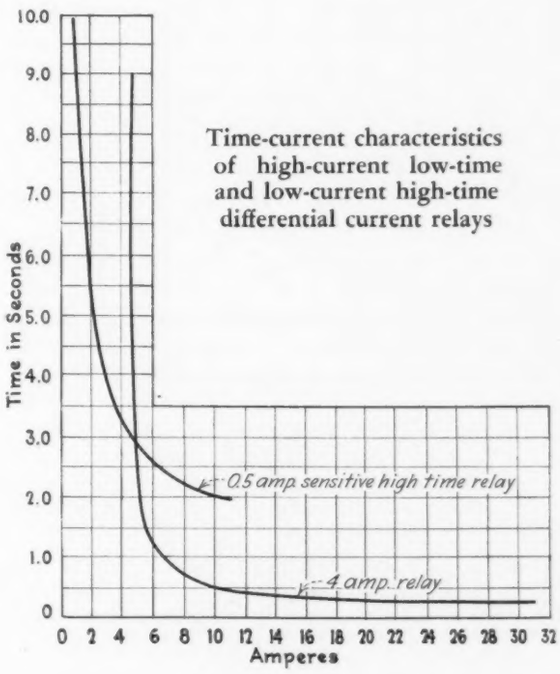
Where the transient inrush currents are only moderately in excess of the general case, a somewhat higher current setting of the relays up to full-load value or more and even a slight increase in time may be the logical solution, but it is limited by the correspondingly lower degree of protection afforded. This practice may be justified on the ground that it costs but little more to replace a quarter of the winding than 5 or 10 per cent of it.

The equipment used by the Carnegie Steel Company is especially adapted to heavy transient inrush magnetizing currents. It consists of an ordinary percentage differential current relay with an additional voltage relay which momentarily raises the current setting. This is accomplished by paralleling the operating coil of the differential current relay with a resistor, thereby raising the setting from its sensitive value to approximately four amperes secondary. This momentarily high setting lasts only for the expected duration of the transient—a period of one or two seconds, adjustable as desired. The voltage relay is supplied by a potential transformer connected to any phase on the power transformer side of either oil circuit breaker. As long as the power transformer is de-energized the voltage relay is in its reset position and the operating coils of the differential relay are shunted, thereby providing the higher setting. When the transformer is excited, the voltage relay is energized, and after a predetermined brief time removes the shunt across the operating coil of the differential current relay.

The use of the potential transformer definitely insures that the power transformer is energized. It is employed rather than auxiliary switches on the oil circuit breakers since it would be possible for any one or all of the associated oil circuit breakers to be closed without necessarily exciting the power transformer.

A high-speed percentage differential relay of the balanced beam type which operates in 0.01 of a second is also available. The momentarily high current setting is secured by a restraining coil, which is controlled by the previously mentioned alternating-current voltage relay.

Another scheme uses two percentage differential relays, one having a low current setting of 10 to 25 per cent of full-load current rating and a time delay of one or more seconds, the other having a high current setting of around double load and a short time setting of $\frac{1}{8}$ second or less. The contacts of both relays are connected in parallel, so that either one can trip the proper oil circuit breakers. The advantages of this arrangement is that it permits very small faults to be detected after they have persisted for a second or more, while large faults are cleared as soon as possible.



Time-current characteristics of high-current low-time and low-current high-time differential current relays

Tube Voltage Regulator Eliminates Hunting Tendency

By F. H. GULLIKSEN

Control Engineering Department,
Westinghouse Electric & Manufacturing Company,
East Pittsburgh, Pa.

A thermionic type voltage regulator for d.c. generators has recently been developed which meets the following requirements:

1. The anti-hunting force should be proportional to the rate of recovery of the regulated voltage.

2. The anti-hunting force must be zero when the regulated voltage is normal at any generator load; i.e., the anti-hunting device should not affect the regulator calibration.

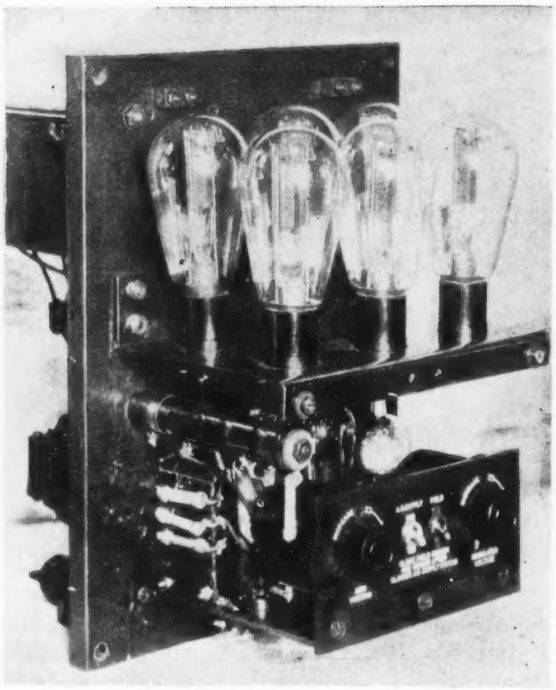
3. The anti-hunting adjustment should be simple and independent of the adjustment for regulated voltage and regulator response.

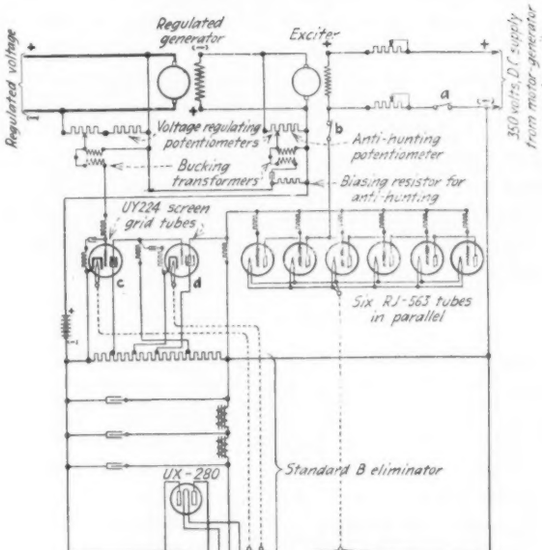
The new device, features of which are illustrated, has a sensitivity and a speed of response which cannot be matched by any mechanical type voltage regulator now on the market. The reasons for its superior performance can be traced back to the inherent characteristics of the thermionic tube, which is a device operating without time lag and without friction and which requires such a low amount of control power that new and radical means for obtaining anti-hunting action can be applied.

The thermionic type voltage regulator will handle a maximum exciter field current of 1.2 amp. and may therefore be applied to generators of ratings up to approximately 300 kw. If the generator field current does not exceed 1.2 amp. the regulator may be applied without using an exciter. In that case the anti-hunting device is not used. Oscillographic tests made with the regulator applied directly to generators of capacities varying from 2 kw. to 10 kw. show that the regulator will bring the voltage back to normal without overshooting in from 2 to 5 cycles when full load is thrown on the machine. The sensitivity obtained with the thermionic regulator is considerably higher than for any mechanical type voltage regulator. The regulator described in this article will regulate the voltage within a range ± 0.1 per cent. This high degree of sensitivity is obtained by applying tubes with high amplification factor and by introducing the proper means for suppressing inherent oscillations in the amplifier system.

During the past several months a model of the thermionic regulator has been controlling the voltage of a 200-kw., 125-volt generator supplying the direct-current power to one of the test floors at the East Pittsburgh plant of the Westinghouse Electric & Manufacturing Company. The regulated voltage curve indicated by a recording voltmeter shows a practically straight line, and so far no changes in tube characteristics have been noticed.

Operation of the thermionic regulator may be understood by assuming that the generator load is increased with resulting drop in regulated voltage. The effect of this voltage drop is to decrease the negative bias on the





Features of thermionic voltage regulator

The voltage drop across the output circuit of the voltage-regulating potentiometer bucks the voltage of a battery so that a negative bias of 2 volts is applied to the control grid of the UY-224 type screen grid detector tube *c*. To prevent the a.c. components of the generator voltage caused by commutator ripples from entering the amplifier system a compensating transformer is applied. The secondary winding of this transformer is connected to buck the primary winding so that the output voltage which is supplied to the grid of tube *c* will be a pure direct-current voltage. When the regulated voltage is normal the exciter armature voltage is constant and the voltage drop across the resistor is zero. If the exciter armature voltage is changing, in order to correct for a change in the regulated voltage there will be a voltage drop across the resistor. The polarity of this voltage drop depends upon whether the exciter voltage is increasing or decreasing and the magnitude of voltage drop will be proportional to the rate of change of the exciter armature voltage.

grid of tube *C*, with the following increase in tube plate current. Due to the resistance coupling between tubes *c* and *d* and between *d* and the RJ 563 power tubes the plate current of tube *d* will decrease and the plate current of the power tubes will increase, with the result that the exciter armature voltage increases, thus bringing the regulated voltage back toward normal. As soon as the exciter armature voltage starts to increase a charging current flows through the biasing resistor into the adjacent condenser, giving the resistor a potential drop of such a polarity that the negative bias on grid *c* tends to increase, thus producing the desired anti-hunting effect. For an increase in regulated voltage the regulator action is exactly opposite to that just described.

Only two adjustments are required to place the thermionic regulator in service and they are so simple that no previous experience with voltage regulators is required to make a perfect installation. The adjustment for proper regulated voltage is made by changing the setting of the radio type generator potentiometer and the correct anti-hunting effect is obtained by means of the exciter potentiometer. In order to take the regulator out of service switch *a* is closed and the resistance of the field rheostat is decreased until the regulated voltage is slightly higher than normal, indicating that the power tube current is zero. Switch *b* may then be opened and manual control obtained through the field rheostat.

Cost of Unfavorable Relations

All sorts of obstructive tactics will be introduced by city officials, newspapers and individuals that will hamper expansion and improvement of service.

Cost of rendering service all along the line will be greater.

Financing will cost more and will be more difficult to secure.

People will be inclined to use the minimum of electricity rather than the maximum.

Productive efficiency and the general morale of the employees will be lowered.

Introduction of municipal ownership propaganda will be invited and facilitated with the confusion which that brings.

Possible loss of franchise through a successful vote for municipal ownership.

Less favorable contracts for franchise renewals.

Encourage agitation for unwarranted and harmful rate reductions.

Tendency to increase the amount of jury verdicts against the company.

Encourage the passage of hampering ordinances by city councils.

Render more difficult and costly the securing of rights-of-way.

Make collections slower.

The tendency to increase taxation assessments.

HARRY REID,

Chairman N.E.L.A. Public Relations National Section.

Industrial Progress Made Despite Business Conditions

By W. H. SAMMIS

Chairman Commercial and Industrial Power and Heating Bureau

Industrial use of electrical energy has increased during the last two decades from 48 per cent of the total output to 56 per cent. This class of business, however, is most susceptible to temporary industrial depressions. As a result there has been a decline of approximately 9 per cent during 1930.

Industrial plants are watching their costs closer than ever. Consequently power and industrial heating sales engineers are spending much of their time keeping in touch with existing customers and looking out for their welfare. With reduced industrial production the bill for purchased power may be a higher percentage of the total cost of production than existed during the days of peak production. This condition requires the explanation that the customer must carry a portion of the fixed charges on the utility's investment to serve him, the same as he does for equipment necessary for production. The principal difficulty encountered is that the fixed charges on the utility's equipment appear in the monthly operating costs, while the fixed charges on the manufacturer's equipment do not.

Large customers must be continually cultivated so that they will not be influenced by some of the misleading statements made by isolated plant salesmen and engineers. In addition, the limited construction programs of many utilities have released engineers who have entered the consulting engineering profession and are now in competition with the utilities in that they seek isolated-plant business from the industrial plants.

Despite these conditions, onward progress has been made. Approximately 120,000 hp. of electric motors is being utilized in connection with oil-pipe-line pumping, of which 70,000 hp. is connected for active duty in the main trunk-line-pipe stations. About 4,000 miles out of a total of 28,000 miles of pipe line in use is entirely electrified.

An immediate potential market for additional pipe-line business is afforded by approximately 300,000 hp. of steam and internal-combustion engine equipment now rapidly becoming obsolete. Construction of new pipe lines, which are being extended daily into new territory, creates new markets.

Data on the location of these pipe lines, information on those electrified and details of various electric installations are being incorporated in a report, available shortly. Attention is called to publications on "Electric Service for Hotels and Office Buildings," "Compressed Air for the Operation of Steam Hammers and Presses," the 1931 revised report on Diesel-engine power costs, "Electric Furnaces with Artificial Atmospheres," "Commercial Cooking and Baking Sales Manual," "Load Building with Electric Fry Kettles," and "Selling Pantry and Counter Equipment." Reports are in process on high-temperature furnaces for heat treating and forging, high-frequency furnaces, structural-steel welding, and modern gas and fuel-oil furnace installations. Outstanding is the "Industrial Heating Manual."

Steel-Mill Tonnage Increased by Twin-Motor Roll Drives*

By H. H. WRIGHT and H. E. STOKES

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Conceptions of steel plant executives and engineers as to the expected output of various sizes and types of reversing mills have become fairly well standardized. Certain standards have been applied in selecting the electric drives.

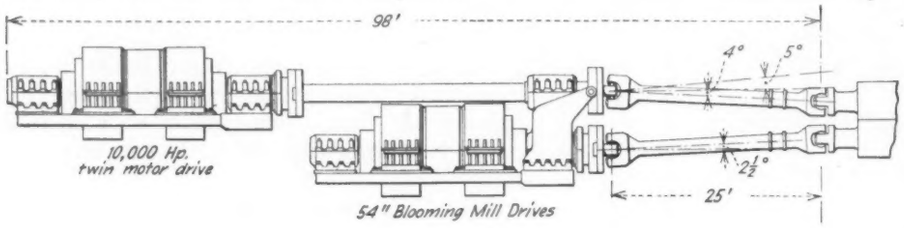
Where twin-motor drive is to be used, a revision of standards will be necessary. Because of the higher average rolling speed and the shortening of intervals between passes, the capacity of a given mill is increased by a change from the conventional single-motor drive. Since the electrical equipment is utilized to better advantage a greater tonnage output with no increase in motor capacity can be expected when the double drive is used. However, in many cases it will be desirable to provide greater motor capacity in order to take advantage of all the possibilities for increased output.

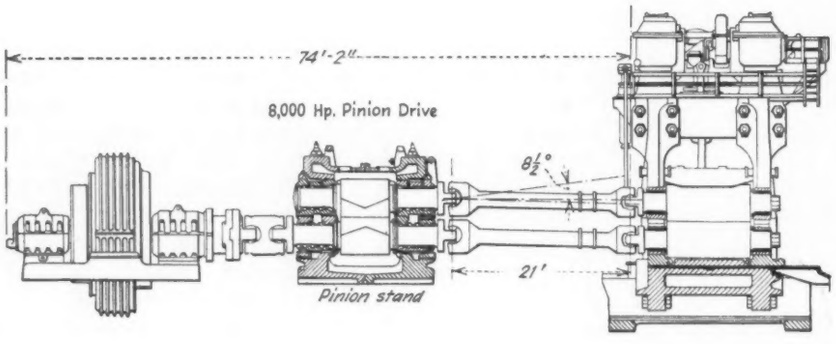
THE recently developed twin drive for reversing mills, in which each of the mill rolls is driven by an individual motor, has five conspicuous advantages over the commonly used single-motor drive:

1. The motor capacity which may be applied to a single pair of rolls is greatly increased.
2. Pinion losses, repairs and maintenance are eliminated.
3. The motors may be designed to have greatly reduced inertia, resulting in less strain on the equipment, more torque available for useful work, reduced motor and generator heating and faster acceleration.
4. Roll chatter and spindle vibration are practically eliminated.
5. Higher rolling speeds can be maintained and mill tonnage can be increased.

Demand for more and more power for heavy blooming and slabbing mills has increased the difficulty of designing both the mechanical and electrical parts of the main drive along conventional lines and made it highly desirable to make drastic changes in the form of the drive. So now a 54-in. blooming mill and a 44-in. slabbing mill, each with main rolls driven by independent motors, are in successful operation. When the electrical equipment for the 54-in. blooming mill first came under consideration it was felt that the continuous capacity and maximum torque of the drive should be greater

Adapted from paper presented at 1931 convention of the Association of Iron and Steel Electrical Engineers.

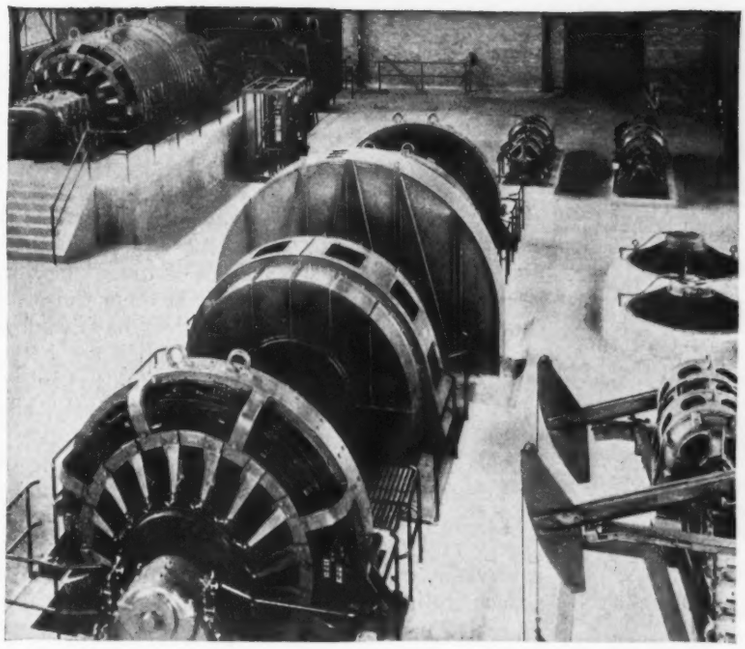




Comparative space requirements and spindle angle of single and twin motor drives

With the pinion drive the spindles operate under the most favorable conditions when the rolls are close together. The heaviest loads usually come when the ingot is large and the upper spindle considerably inclined. With twin-motor drive the spindle angle is a minimum when the rolls are considerably separated, which is more nearly the condition for maximum loads. The upper motor drives through a jackshaft.

An "A" frame on the mill end of the lower motor supports a pedestal bearing which carries the outer end of the jackshaft. The pedestal which supports the jackshaft has no thrust bearing, the thrust being taken on the mill end pedestal of the upper motor. The lower motor has the usual thrust bearing. The driving halves of the universal couplings next to the motors can be removed for renewal or repair.



Twin-motor drive on 54-in. blooming mill

In the center is the flywheel motor-generator set consisting of three 3,000-kw., 700-volt generators, connected in parallel and driven by a 6,500-hp. induction motor. Back at the left is the top roll motor of the twin drive. Under its jackshaft is the other motor.

than anything which had been used previously, to provide power to roll heavier sections at higher tonnage rates. For the higher motor torques it was thought that the new mill would be improved mechanically by eliminating the mill pinions, made possible by use of the twin drive. The mechanical improvement has been realized, but other advantages, such as greater flexibility, greater ease of handling, lower motor inertia, higher average rolling speed and greater tonnage output, so far outweigh the expected advantage that it now seems insignificant.

Operating characteristics of the 10,000-hp. twin-motor drive on the 54-in. mill are quite different from those of a conventional reversing equipment driving through pinions. Probably the first thing which impresses an observer in the mill pulpit is the quietness of the mill. The steel enters the rolls without shock and the usual vibration and noise in the mill spindles is absent. There is practically no tendency for the mill to chatter when the steel enters the rolls. On this account the roller does not have to exert the usual care in feeding the steel between rolls. It can enter on the first trial, even at higher speed, and therefore save time on the early breakdown passes.

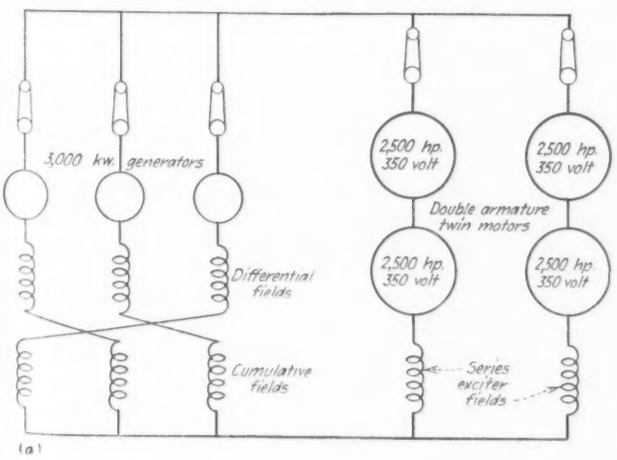
With twin-motor drive the phase positions of the rolls can shift independently so that they can quickly adjust themselves to the steel, thus removing the chief cause of roll chatter. On the other hand, with pinion drive, the independent movement of the rolls is limited by the backlash in the pinions and spindles. The lack of independent movement of these parts tends to make the chattering worse. Unusually high rates of acceleration and deceleration constitute another feature of the twin-drive mill. This is due to the comparatively low inertia of the motors, which allows the control to be designed for unusually fast field response without causing high acceleration currents and high reverse power currents. The electrical equipment is therefore used to better advantage and the capacity for useful work is increased. The rapid

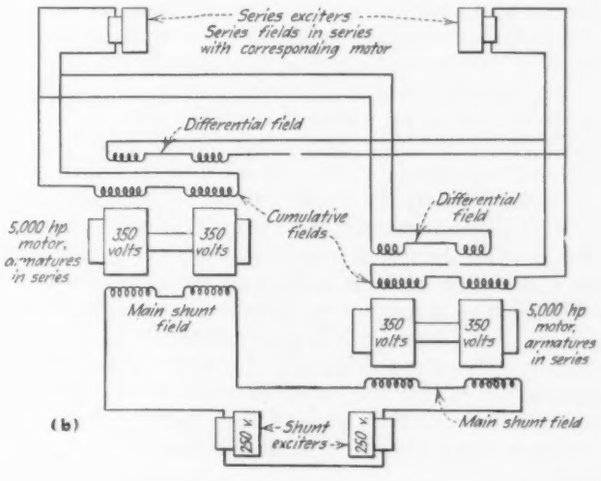
Electrical scheme of twin-motor drive

The drive consists of two 5,000-hp. 40/80-r.p.m. double-armature motors with a combined maximum torque rating of 3,940,000 lb.-ft. Connection of the shunt fields of both motors in series insures the same shunt field excitation for both motors. The series exciter generator having its series field in the armature circuit of one double armature motor excites the cumulative field of that motor and the differential field of the other motor. Any tendency of one motor to take more than its share of the load strengthens its field and weakens the field of the other motor, thus quickly reestablishing equilibrium.

A similar scheme is used in balancing the loads on the three generators of the motor-generator set. The generator excitation is different in that the series fields are excited directly without the use of series exciters, and the current from one generator excites its own differential field and the cumulative field of the adjacent generator.

Any desired speed regulation can be obtained without interfering with the load-balancing characteristics, and these can be varied without affecting the compounding.





response of the motors makes the drive much more easily handled than the usual drive and the steel is kept closer to the mill, with the result that the intervals between passes are shortened. The increased speed of response was quite noticeable to the roller on the 54-in. blooming mill when the mill was first placed in operation. This roller had previously operated an equipment with a 50 per cent higher base speed, but, due to its comparatively greater inertia and slower fields, the acceleration of the older drive was noticeably slower.

Quick response of the motors increases the entering speed and average rolling speed, thereby decreasing the rolling time and increasing the percentage of time that metal is in the rolls. This effect is reflected in the increased power input necessary to keep the flywheel motor-generator up to speed. An 8,000-hp. single-motor 54-in. mill drive in the Pittsburgh district has a flywheel set with a 5,000-hp. driving motor. Satisfactory operation is obtained with a slip regulator setting of 5,000 kw. When rolling the same weight ingots with the same number of passes and with practically the same load currents in a mill with twin-motor drive a slip regulator setting of 7,500 to 8,000 kw. is required to keep the flywheel set up to speed when rolling at a rate which is easily maintained; showing that the rolling is done at a faster rate.

Double-motor-drive advantages overbalance cost difference

First costs of twin-motor and single-motor-pinion drives bear a relationship which will vary with the size and torque requirements of the mill. Two motors with the necessary shafting and bearings are more expensive to build than a single motor of equivalent capacity. This increased cost may be somewhat less than the cost of a pinion stand with spare pinions and bearings in the case of a heavy mill and somewhat greater for a light mill. In general, the difference in cost is not great and is a minor consideration as compared to the advantages of the double drive.

Twin-motor drive offers advantages for wide strip mills, both for hot rolling and cold rolling. The chief advantage is that the elimination of the mill pinions does away with the necessity for accurate matching of the mill rolls. In either hot rolling or cold rolling, unless the rolls are very accurately matched, extremely high stresses are set up in the pinions to cause the larger roll to slip and equalize the delivery speeds. With double drive the motor speeds easily adjust themselves so that each roll has the same surface speed. The problem of load division is quite simple, as wide, thin material forms practically a 100 per cent coupling between the rolls.

The simplest form of drive for a strip mill is a direct-connected motor on either side of the mill, each motor driving one working roll. This arrangement may be objected to, especially for hot mills, on account of the space taken up by the motor and spindles on the side of the mill which is usually left open. This objection can be overcome by the use of special gearing which will permit the installation of both motors on the same side of the mill. Such an arrangement introduces no new mechanical complications, because it is now customary to use geared motors with pinion drive and the total number of gear units would remain the same. Instead of a reduction unit and a mill pinion unit, each of full capacity, there would be two reduction units, each of half the total capacity.

READERS' FORUM

Interchanges Power with Industrial Plant

To the Editor of the ELECTRICAL WORLD:

No doubt there are quite a number of cases where industrial plants have surplus power available which could be used by the utility and where at other times the utility could supply power from their lines to advantage. But the arrangement of a power interchange between the utility and industry with such conditions requires a very careful power analysis and considerable sales effort of a special nature.

About two years ago we were able to negotiate an interchange arrangement with an industry in our territory which has proved very satisfactory to both the industry and our company. This industry produces pig iron, coke, cement and certain by-products. Under the agreement it purchases, at a regular power rate, sufficient power to make up shortages during certain periods and at other times we purchase its surplus power. You will find below a table showing the amount of power which this industry purchased during twelve months and the amount which it sold to us, giving approximate load and number of kilowatt-hours involved.

	Energy Sold to Industrial by Utility		Energy Purchased from Industrial by Utility	
Mo. and Year	Demand (Kw.)	Kilowatt-Hours	Maximum Load (Kw.)	Kilowatt-Hours
May, 1930	1,800	16,000	6,000	2,353,200
June	1,240	8,000	5,000	1,518,000
July	0	902	5,000	2,035,600
August	902	8,000	6,000	1,360,400
September	0	0	3,000	1,378,800
October	1,760	246,000	1,000	341,200
November	2,080	152,000	3,000	469,600
December	1,920	215,100	6,000	979,600
January, 1931	2,240	55,500	8,000	1,486,800
February	2,240	199,700	3,000	367,200
March	2,000	59,000	4,000	1,230,800
April	1,760	48,700	6,000	1,429,200
Total		1,008,902		14,950,400

VICE-PRESIDENT IN CHARGE OF SALES.

Hollinwood, Lancashire, England.

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Indirect Revenue from Radio Sets

To the Editor of the ELECTRICAL WORLD:

In your issue of June 20, page 1175, general calculations are made showing that radio sets averaging 100 watts at 5.22 hours per day bring revenue to the utility company of $8.75 per set annually.

While I think this is probably an overestimate as regards the radio set consumption, I think it is negligible in comparison with the amount of additional lighting current sold.

Listeners stay up later in the evening, and seldom listen in the dark, so that the indirect revenue from a radio set is probably three or four times as much as the direct income, and clearly radio sets on the mains are to be encouraged.

R. H. SCHOFIELD,
General Sales Manager.

Men of the Industry

D. C. Jackson Recent Recipient of Lamme Medal

DUGALD C. JACKSON, who was recently awarded the Lamme medal by the Society for the Promotion of Engineering Education, as announced in the July 11 issue of the ELECTRICAL WORLD, is one of the outstanding educators in the present engineering era, holding at the present time the chair of electrical engineering at the Massachusetts Institute of Technology. He entered upon his academic career in 1891 as professor

of electrical engineering at the University of Wisconsin, developing at that institution one of the earliest electrical departments in American universities. It was in 1907 that Professor Jackson was called to the Massachusetts Institute of Technology and in that same year was put in charge of the electrical engineering department.

His value as an educator was enhanced by his belief—and this conviction he put into practice—that the head of an engineering department in a university must be active professionally. During his entire academic career he has maintained a consulting practice, first in partnership with his brother and more recently with Edward L. Moreland, with headquarters in Boston. In this connection Professor Jackson has established a reputation as a valuation expert. As far back as 1911 he was retained by the British government as adviser in the valuation of the national telephone system, not to mention the various interests which have consulted him on their problems in this country.

Professor Jackson is a past-president of the American Institute of Electrical Engineers, the Society for the Promotion of Engineering Education and the Boston Society of Civil Engineers. In addition he is a fellow of the American Association for the Advancement of Science and a member of the American Society of Mechanical Engineers, the American Institute of Consulting Engineers, Institution of Electrical Engineers (British), Société Francaise des Electriciens and the Illuminating Engineering Society. He is the author of several technical books and has been a frequent contributor to electrical literature.

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RALPH M. HOFFMAN, for eight years manager of the Seattle office of the Pacific division of the Link-Belt Company, has been appointed vice-president and sales manager of that division, with headquarters at San Francisco. He succeeds Harold H. Clark, who retired June 1. Twenty years of experience on the Pacific Coast in selling elevating, conveying and power-transmitting equipment well fits him for his new position. His activities in trade affairs has kept him well informed on the needs of the various industries. Graduating from the University of Minnesota in 1911, Mr. Hoffman journeyed to Seattle, where he joined the Meese & Gottfried Company, later opening an office for it in Vancouver. When that company merged with the Pacific division of the Link-Belt Company Mr. Hoffman was made manager of the Seattle office.

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J. E. WAGGONER has been appointed research director of *Electricity on the Farm* by the Case-Shepperd-Mann Publishing Corporation. He has been active for twenty years in the field of rural electrification. Mr. Waggoner started the department of agricultural engineering at Mississippi State College in 1910 and the next year organized the International Harvester Company's service bureau, carrying on agricultural extension work for that company for five years and then becoming advertising editor of the International Harvester Company. From 1926 to 1928 he was manager of the Texas Committee on the Relation of Electricity to Agriculture and subsequently was with the Delco Appliance Corporation of Dayton and Rochester and the Oliver Farm Equipment Company, Chicago. He will make his headquarters in Chicago.

Julius Daniels New President of Illuminating Society

JULIUS DANIELS, who was elected president of the Illuminating Engineering Society, to take office at the annual convention of the organization in October, as announced in the July 11 issue of the ELECTRICAL WORLD, has had a distinguished career in the lighting field. He had directed the work of the illuminating engineering department of the Edison Electric Illuminating Company of Boston for some years until his transfer to

the post of assistant superintendent of the promotion department of the same company. In his contacts with civic bodies and governmental organizations he has served effectively as a liaison officer between these groups and the company. The Boston company won the Coffin medal at the National Electric Light Association convention during Mr. Daniels' direction of the illuminating branch of the company's service and he has long been active in the New England division of the association, having served for a term as chairman of the commercial section.

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SUMNER R. KEYES, assistant superintendent and purchasing agent of the Edison Electric Illuminating Company of Boston, has been elected president of the New England Purchasing Agents' Association. Mr. Keyes has just retired as chairman of the public utility group of the National Association of Purchasing Agents.

W. H. Taubert Assumes New Duties in Corning

W. H. TAUBERT, who has been identified with the public utility industry and related fields for more than twenty years, has recently been placed in charge of sales of the insulation division of Corning Glass Works. He is removing to the home office at Corning, N. Y., from

New York City, where he had served for four years as Eastern representative for the sale of "Pyrex" power insulators. Prior to his association with Corning Glass Works Mr. Taubert was a member of the R. W. Lillie Corporation, high-tension equipment specialists. His earlier experience includes ten years in the electric cable division of the American Steel & Wire Company.

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L. C. ARMITAGE, formerly industrial heating engineer for the General Electric Company, is now designing engineer for the Ajax Electric Company, Inc., Philadelphia, Pa.

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CHESTER LICHTENBERG has been appointed engineer, electric refrigeration department, Fort Wayne works of the General Electric Company. Mr. Lichtenberg was graduated from Columbia University with the degree of electrical engineer. He then spent one year with Prof. M. I. Pupin making investigations in connection with long-distance telephony. In 1907 he entered the testing department of the General Electric Company and about a year later he was transferred to the switchboard engineering department. After his honorable discharge from military service he returned to the General Electric Company, where he was placed in charge of the design, manufacture and exploitation of automatic stations and substations. In 1927 he was appointed assistant engineer, switchgear department, Philadelphia Works, with enlarged duties. He has been intimately identified with technical committees of the American Institute of Electrical Engineers, National Electric Light Association and National Electrical Manufacturers' Association.

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CLIFFORD S. BILLINGS has become associated with the Public Utility Holding Corporation of America as operating sponsor of its properties. He was formerly associated with the Electric Bond & Share Company in the same capacity. Mr. Billings has also been elected New York vice-president of the Central West Public Service Company, to succeed A. W. Mellen, Jr.

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J. H. Lobban Heads N.E.L.A. Accounting Section

J. H. LOBBAN, who was named chairman of the Accounting National Section of the National Electric Light Association, as announced in the July 4 issue of the ELECTRICAL WORLD, has been continously identified with the Detroit Edison Company since 1911. In 1913 he was made property engineer, a position he retained until 1918, when he was made assistant general accountant. It is this position which he now occupies.

Mr. Lobban was born in 1887 in a rural community near Flint, Mich. He

first became identified with the public utility industy in 1906 in the power department of the Detroit United Railway. Following graduation from the University of Michigan with degree in electrical engineering in 1911, he entered the statistical department of the Detroit Edison Company.

OBITUARY

G. C. CREE, engineer connected with the central-station engineering department of the General Electric Company, Schenectady, was drowned, July 20, off Association Island, convention headquarters of the General Electric Company in Lake Ontario, when a sailboat capsized. Mr. Cree, who was 40 years old, arrived at Association Island the day before his death to attend the general convention of the company in session this week.

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JOHN N. CARLISLE, president of the Northern New York Utilities, Inc., and for many years prominently identified with the public utility industry up state, died July 21 at his home in Watertown, after an illness of five months. Mr. Carlisle, who is a brother of Floyd L. Carlisle, held many public offices in the course of his career. As state highway commissioner from 1913 to 1915 he built Storm King Highway and many miles of state roads in northern New York. He was Public Service Commissioner from 1910 to 1912 and in 1919 he investigated Albany civic affairs for a committee of the Common Council. Born in Preble, Cortland County, Mr. Carlisle removed to Watertown as a boy, studying law, after getting his high school education, with Judge Henry Purcell. He was admitted to practice in 1889.

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WALTER HUNTER WHITESIDE, Pacific Coast representative of the Westinghouse Electric & Manufacturing Company until his retirement from active business six years ago, died suddenly, July 17, at his home in Pasadena, Calif., in his seventy-first year. Mr. Whiteside became Pacific Coast representative of the Westinghouse company in 1916, with offices in Los Angeles, Calif., and directed affairs of the company on the coast until 1926, the time of his retirement from business. During his residence in Los Angeles he was active in civic affairs and the affairs of the American Institute of Electrical Engineers and American Society of Mechanical Engineers. Before first becoming associated with the Westinghouse company in 1898, Mr. Whiteside was connected with the Hercules Powder Company and the Cleveland (Ohio) Electrical Manufacturing Company. He later was general manager in New York City of the Sawyer-Man Electric Company and from 1904 until 1911 was president of the Allis-Chalmers Company of New York. He resigned from that company to become president of the Stevens-Duryea Company, which he directed until he rejoined the Westinghouse organization in 1916.

Financial and Statistical News

SECOND quarter reports of the electrical manufacturers reflect business recession vividly. General Electric net sales are down 25 per cent over the first six months of last year. Westinghouse has made a better showing than for the first quarter, although totals are down one-third from the second quarter of last year.

——BOND PRICES OF UTILITIES WERE WELL SUSTAINED THIS WEEK, and common stock prices moved upward slightly. ELECTRICAL WORLD index of operating and holding company stocks stands at 61.1, against 60.0 a week ago and a high of 74 for the year to date.

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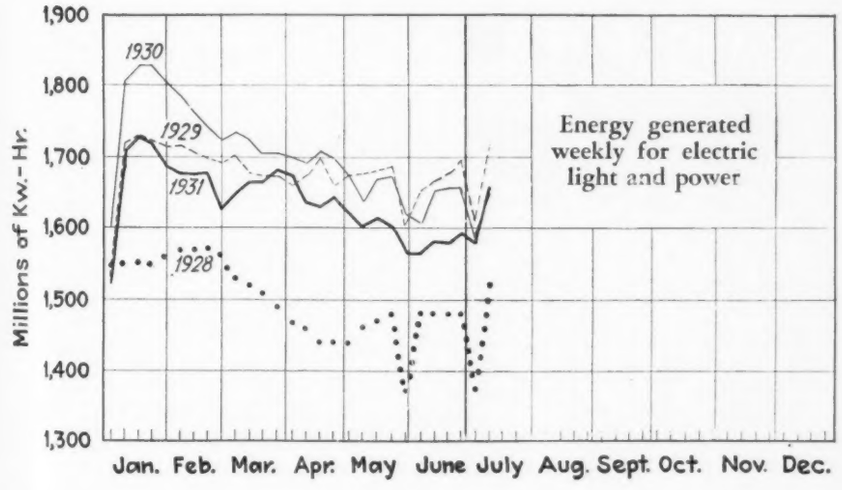
Weekly Output Attains 1930 Level

IN THE WEEK ENDED July 11 the energy output of electric light and power plants for the first time in 1931 overshot that for the equivalent period in 1930. During recent weeks and correspondingly in the three preceding years the energy generated, as estimated by the statistical research department of the National Electric Light Association, was:

	Millions of Kw.-Hr.			
Week Ended	1931	1930	1929	1928
June 13.....	1,581	1,663	1,675	1,480
June 20.....	1,579	1,656	1,678	1,480
June 27.....	1,593	1,657	1,698	1,480
July 4.....	1,576	1,581	1,611	1,366
July 11.....	1,655	1,650	1,717	1,521
July 18.....	1,667	1,693	1,748	1,530

Previous reports had foreshadowed equality with 1930. Beginning with the week ended June 13 the deficiency, in per cent, compared with 1930 had been successively 4.9, 4.6, 3.9 and 0.3, followed by an excess of 0.3 per cent. Last week it changed to a 1.6 per cent loss.

The greatest advance over 1930 is on the Atlantic Seaboard, where, for several weeks, the output has been averaging 4 or 5 per cent ahead of last year's. Somewhat smaller gains have characterized the Chicago area, although the central industrial region continues to show moderate losses. On the Pacific Coast slight gains over 1930 operations, usually 2 or 3 per cent, have reappeared after lower figures early in the month.



Dow Finds Industry Improving

CONDITIONS generally in industry are beginning to improve, Alex Dow, president Detroit Edison Company, told the Michigan Public Utilities Commission, in applying for authorization of a new security issue.

Although he was careful to explain that he is not anticipating the sudden return of boom conditions, Mr. Dow said prospects are sufficiently encouraging so that his company wants to have a large fund of ready cash available for use in making extensive plant improvements. Mr. Dow indicated that the construction program would start as soon as present industrial improvement has established a slightly firmer foundation.

Pacific Gas Control Still on the Pacific

IN ANSWER to a recent statement that was made to the effect that the North American Company, which owns a substantial amount of the Pacific Gas & Electric Company common stock, now controls the company and directs its operations, A. F. Hockenbeamer, president Pacific Gas & Electric Company, said:

"All of the outstanding stock of the Pacific Gas & Electric Company, both common and preferred, has equal voting power. The company, being a California corporation, could not, under the law, have granted voting rights to one class of stockholders and denied them to another class. This principle is also embodied in its charter and will govern all future issues of stock. The present confusion has probably arisen from the fact that many Eastern companies, operating under different laws, have non-voting preferred stocks.

"As of June 30, 1931, the company had outstanding a little over 10,812,000 shares of all classes of stock. This does not include any of the preferred stocks of the Great Western Power Company of California, Feather River Power Company and San Joaquin Light & Power Corporation that were still outstanding as of that date.

"Also as of June 30, the North American Company and its subsidiary, the Western Power Corporation of New York, owned 2,008,729 shares, or 18.58 per cent of all the Pacific Company's outstanding stock. In the near future the Pacific Gas & Electric Company will probably make an offer to the San Joaquin Light & Power Corporation's preferred-stock holders to exchange their stock for Pacific Gas stock. When this has been accomplished the North American Company's ownership will be reduced to 17½ per cent.

"The North American Company formerly controlled the Great Western Power Company through the ownership of 62.7 per cent of its stock, the San Joaquin Light & Power Corporation through the ownership of 51.9 per cent of its stock and the Midland Counties Public Service Corporation through the ownership of 100 per cent of its stock.

Standard Gas interests

"About four years ago the Standard Gas & Electric Company of Chicago sold its controlling interest in Western States Gas & Electric Company and Coast Valleys Gas & Electric Company, in consideration of the issuance to it of common stock of the Pacific Company. These companies had theretofore been operated from Chicago. The Standard company, as of June 30, 1931, owned 377,520 shares, or a little less than 3½ per cent, of the Pacific company's stock.

"The aggregate market value of the outstanding stocks of the Pacific Gas & Electric Company is not far from $425,000,000. Including the unexchanged stocks of subsidiaries, it would not be far from $450,000,000. These figures are, of course, based on the present generally depressed market. Without making any allowance for the higher prices that would follow any concentrated buying, it is obvious it would take from $4,250,000 to $4,500,000 for any new or existing interest to acquire or add as little as 1 per cent of the company's total outstanding stock to its holdings.

"It must be obvious from the foregoing figures that control of the Pacific Gas & Electric Company remains, where it always has been, in California, and is likely to remain so. In fact, instead of control, as alleged, having passed to Eastern interests, the Pacific Gas & Electric Company has returned to California control the properties of the Western States Gas & Electric Company, Coast Valleys Gas & Electric Company, Great Western Power Company, San Joaquin Light & Power Corporation, Midland Counties Public Service Corporation, Sierra & San Francisco Power Company, and others, which before their acquisition by the Pacific company were, beyond any question, controlled by Eastern interests.

"Anybody wanting to do business with the Pacific Gas & Electric Company, whether it be to sell it a bucket of paint or buy a $25,000,000 bond issue, will still have to do business at 245 Market Street, San Francisco."

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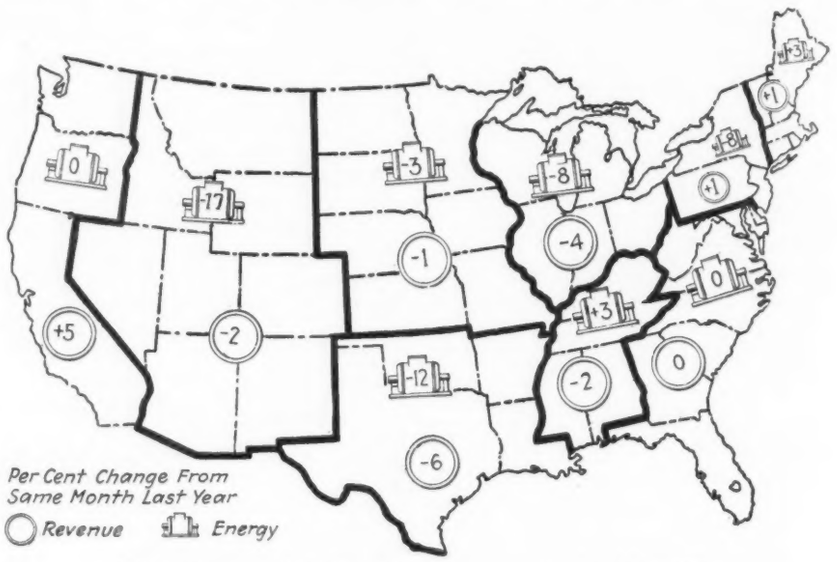
Power Industry Shows Seasonal Changes

MAY OPERATIONS of the electric light and power industry show approximately the normal seasonal changes compared with April; generally speaking, they are not quite up to last year's level. But in one important respect an exception is revealed in the returns received by the ELECTRICAL WORLD from light and power companies. More than offsetting the comparatively slight decrease in revenue, operating expenses are being sharply curtailed, so that the net income is actually 1 per cent greater that it was for the corresponding month in 1930.

Compared with the corresponding month of last year, the revenue, $171,180,000, is down 1.0 per cent; operating expenses, $74,560,000, are down 4.3 per cent; energy generated, 7,175,746,000 kilowatt-hour, is down 4.9 per cent.

The decrease of $5,030,000, in revenue, combined with the difference in the length of the month, constitutes a decrease of 6.5 per cent in average daily revenue compared with April. The change agrees closely with the average for a term of years and so it does not represent any appreciable change of tempo, either favorable or unfavorable.



West Coast makes best showing compared with 1930

Of the output, 41 per cent or 2,940,705,000 kw.-hr., came from water power; the amount was 1.9 per cent less than last year. Energy from fuel, 4,235,041,000 kw.-hr., was 6.8 per cent less than last year. The decrease was accompanied by an even larger reduction in fuel consumption, coal and oil falling off by more than 10 per cent each against a slight increase in the amount of natural gas. The combined

Table I—Central-Station Financial Operations in the United States

Compared with Corresponding Month of Previous Year

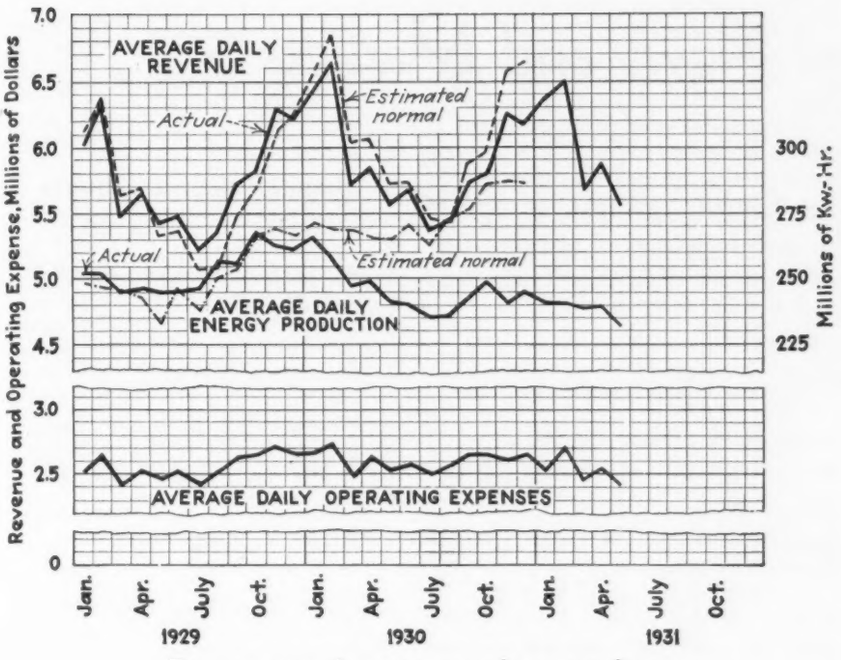
Month	Total Gross Revenue from Sale of Energy*			Total Operating and Maintenance Expense†		
	1931 Thousands	1930 Thousands	Per Cent Inc.	1931 Thousands	1930 Thousands	Per Cent Inc.
February	$182,280	$185,800	—1.9	$75,820	$77,300	—1.9
March	175,840	176,400	—0.3	76,520	77,200	—0.9
April	176,210	176,100	+0.1	75,880	78,300	—3.1
May	171,180	172,900	—1.0	74,560	77,900	—4.3

Table II—Central-Station Fuel Consumption in the United States‡

Compared with Corresponding Month of Previous Year

Month 1931	Coal		Oil		Gas	
	Short Tons	Per Cent Increase	Barrels	Per Cent Increase	Thousands Cubic Feet	Per Cent Increase
February	3,022,123	—3.5	615,967	—8.8	9,113,266	—0.7
March	3,140,873	—0.7	612,590	0	10,113,630	+8.4
April	2,714,569	—9.2	528,828	—10.1	9,615,257	+0.9
May	2,705,195	—10.9	592,202	—10.3	9,855,664	+2.7

*Aggregate gross revenue from consumers and from other utilities for energy for resale, involving a certain amount of duplication.
†Do not include interest, taxes, depreciation or sinking fund, with some unavoidable exceptions. ‡As collected by the U. S. Geological Survey.



Revenue repeating 1930 record; energy down

effect of the decrease in output and of the growing efficiency in the use of fuel was a reduction of 300,000 tons of coal compared with the consumption in May, 1930.

Regionally, the only group of states showing an appreciable increase in revenue compared with April was the Pacific, with 5.6 per cent; very slight gains were made also in the West South Central and Mountain states; all the other sections reported a seasonal decrease, generally between 4 and 5 per cent. Compared with 1930 however, a gain of 4.5 per cent is revealed in the Pacific group, as well as small gains in New England and in the Middle Atlantic states. In connection with the decrease of 5.7 per cent in the West South Central states, shown in Table IV, the extraordinary gain registered in that section a few years ago should be borne in mind.

In New England a definite industrial recovery seems to be indicated by the somewhat larger energy output compared with 1930, a condition which has prevailed for several months.

Table III—Energy Output of Central Stations in the United States

Compared with Corresponding Month of Previous Year

Month 1931	Generated, Thousands of Kw.-Hr.*						Purchased for Resale	
	Total		Hydro		Fuel			
	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Thous. Kw.-Hr.	Per Cent Inc.
February	6,750,223	—5.9	2,045,971	—20.8	4,704,252	+2.3	1,826,000	+11.7
March	7,423,871	—3.4	2,488,399	—19.3	5,935,472	+7.3	1,933,000	+9.6
April	7,188,503	—4.5	2,946,441	—4.9	4,242,062	—4.3	1,864,000	+9.0
May	7,175,746	—4.9	2,940,705	—1.9	4,235,041	—6.8	1,859,000	+6.2

Table IV—Ragional Operations Revenue and Energy Output in May, 1931

Compared with Corresponding Month of Previous Year

Region	Revenue		Energy Generated, Thousands of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.
United States	171,180	—1.0	7,175,746	—4.9	2,940,705	—1.9	4,235,041	—6.8
New England	16,930	+1.2	480,601	+2.7	308,471	+43.7	172,130	—31.9
Middle Atlantic	44,590	+0.7	1,667,145	—7.6	535,963	—0.6	1,131,182	—10.7
East North Central	41,040	—4.1	1,708,936	—7.9	158,702	—30.2	1,550,234	—4.8
West North Central	14,440	—1.1	464,823	—3.1	112,895	—27.9	351,928	+8.8
South Atlantic	18,740	+0.4	906,067	+0.2	576,699	—14.1	329,368	—17.4
East South Central	5,750	—2.0	328,267	+2.8	278,852	+3.0	49,415	+1.7
West South Central	8,770	—5.7	365,546	—12.3	6,962	—6.7	358,584	—12.4
Mountain	4,130	—2.4	250,621	—17.0	212,353	—18.6	38,268	—6.6
Pacific	16,790	+4.5	1,003,740	0	749,808	—8.1	253,932	+42.4

*By courtesy of U. S. Geological Survey, with deductions for operations not regarded as central-station operations.

219,687 Stockholders Own California Utilities

STATISTICS COVERING THE DISTRIBUTION of ownership of the gas and electric companies of the state, which show that there are 219,687 California owners of these utilities holding $338,285,000 par value of stock, with an aggregate present-day market value of almost half a billion dollars, have recently been compiled by the Pacific Gas & Electric Company.

The stocks of the nine major operating companies, namely, Pacific Gas & Electric Company, Southern California Edison Company, Los Angeles Gas & Electric Corporation, Southern California Gas Company, Southern Counties Gas Company, San Diego Consolidated Gas & Electric Company, California Oregon Power Company, Coast Counties Gas & Electric Company and Nevada California Electric Corporation, are owned by 236,453 investors, of whom 188,150, or four-fifths, are California residents, and 48,303 reside outside of the state. In addition, the stocks of the Pacific Lighting Corporation and Pacific Public Service Company (the former qwing a controlling interest in the Los Angeles Gas & Electric Corporation and affiliated companies, and the latter in the Coast Counties Gas & Electric Company) are held by 31,537 Californians and 2,332 outsiders. Altogether, there are more than 270,000 partners in these utility enterprises.

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Utility Bonds Called for Payment

AMONG THE UTILITY BONDS recently called for payment in advance of maturity are the following:

All of the outstanding first lien and refunding mortgage gold bonds, series B, 6 per cent, due October 1, 1953, and first lien and refunding mortgage gold bonds, series C, 5½ per cent, due March 1, 1954, of the Houston Lighting & Power Company, August 10 at par and interest to August 10, together with a premium of 5 per cent of the principal amount of the series B bonds and 4 per cent of the principal amount of the series C bonds.

Completion of extensive refunding operations by the Pacific Gas & Electric Company was indicated with the calling for redemption of 6 per cent first mortgage bonds of the California Telephone & Light Company, amounting to $707,000, and 5 per cent bonds of the Consolidated Electric Company to the amount of $1,473,500.

Toho Electric Power Company, Ltd., of Japan has called for redemption on September 15 first mortgage 7 per cent bonds, series A, totaling $275,000.

Business News and Markets

Westinghouse Earnings Up in June Quarter

NET PROFIT OF $926,604 for the second quarter of 1931, against a net loss of $2,885,945 for the first quarter, is reported by Westinghouse Electric & Manufacturing Company. The half-year net result is thus a loss of $1,959,341, against a net profit of $8,357,362 for the first half of 1930.

Net sales billed for the June quarter were $32,147,158, compared with $28,476,175 in the first quarter of 1931, and with $47,978,102 in the second quarter of 1930. For the six months, net sales billed were $60,623,333, against $93,022,036 in the first half of 1930. Comparisons of all details of the current statement with those of preceding years are not possible, because of a change in method of reporting, and the first-quarter figures have been adjusted in the following tabulation:

For 1931	2d Quarter	1st Quarter
Net sales billed	$32,147,158	$28,476,175
Cost of sales billed, depreciation, general expenses, provision for employees' service annuities, reserves and all taxes	31,844,799	31,726,356
Net operating profit	$302,359	*$3,250,181
Other income, less interest and miscellaneous charges	624,245	364,236
Net income	$926,604	*$2,885,945

*Loss.

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Kelvinator Earnings Show Improvement

ACCORDING TO A STATEMENT recently issued, covering particularly the June quarter of the year, the Kelvinator Corporation, Detroit, manufacturer of electric refrigeration, shows a steady improvement despite general business conditions. Some of the details follow:

Kelvinator corporation closed the June quarter with net profit after federal taxes in excess of the $1,414,467, or $1.19 a share on the 1,186,106 common shares reported for the quarter ended June 30, 1930. Profits before federal taxes in April and May totaled $1,300,000 and June profits are estimated at $400,000, or an indicated total of $1,700,000 for the period. This would work out at about $1.40 a share on 1,186,106 common shares outstanding figured after all charges but before federal taxes.

The outlook for the company's current fiscal year, which ends September 30, is somewhat improved as compared with the last fiscal year.

Inventory June 1 totaled approximately $3,600,000, as compared with $5,000,000 a year ago. Yet unit sales in June are larger than in June, 1930. Cumulative unit shipments to June 22 were 89,850 against 79,978 in the corresponding period of the preceding fiscal year. For the month of June the company shipped more than 11,000 units, against 8,660 units in June, 1930.

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Foreign Business Firms Copper Price

A FEW HUNDRED TONS of copper was sold during the week at 7¾ cents, delivered, but improved foreign business later caused custom smelters to withdraw offers at that level in large part, and a few lots were sold at 8 cents. The market was never really firm at 8 cents, however, for demand did not amount to anything and customers at points in the Middle West, where a premium is ordinarily charged, were able to get a little copper at the even figure.

	July 15, 1931 Cents per Pound	July 22, 1931 Cents per Pound
Copper, electrolytic	7¾	7¾–8
Lead, Am. S. & R. price	4.40	4.40
Antimony	6.85	6¾
Nickel, ingot	35	35
Zinc, spot	4.25	4.25
Tin, Straits	24–24¼	24¼
Aluminum, 99 per cent.	23.30	23.30

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Hygrade Sylvania Appoints Officers

THE NEWLY APPOINTED OFFICERS of the Hygrade Sylvania Corporation, successor to Hygrade Lamp Company, Sylvania Products Company and Nilco Lamp Works, Inc., manufacturers of incandescent lamps and radio tubes, are Edward J. Poor, chairman of board; B. G. Erskine, president; Frank A. Poor, treasurer; Walter E. Poor and Guy S. Felt, vice-presidents; John S. Learoyd, Jr., clerk and secretary, and M. F. Balcom, assistant secretary.

General Electric Orders Down 25.6 Per Cent

ORDERS RECEIVED by the General Electric Company for the first six months of 1931 totaled $141,428,978, against $190,313,758 for the corresponding period last year, a drop of 25.6 per cent. Sales billed for the six months of 1931 were $141,180,091, against $197,229,346 the first half of last year. Details of the half-year's business will be published in next week's issue.

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New Westinghouse Appointments

APPOINTMENT OF J. M. HIPPLE as general works manager for the Westinghouse Electric & Manufacturing Company has been announced by J. S. Tritle, vice-president and general manager. C. H. Champlain, manager of the Westinghouse works at Sharon for the last eight years, succeeds Mr. Hipple as works manager at East Pittsburgh. Mr. Hipple has been works manager of the East Pittsburgh works since September 1, 1927. After graduating from Ohio State University in 1898 he joined the Westinghouse company and for one year was engaged in the testing department. He then was assigned to the engineering department. In 1911 he was made manager of the motor engineering department and headed this department until his appointment as works manager.

M. L. Fawcett has been appointed works manager at Sharon. In addition to his present duties as works manager at East Springfield, Mass., A. B. REYNDERS will have supervision over the operations of the Mansfield works, and J. E. BARKLE will have supervision over the Newark works.

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DELINQUENT ELECTRICAL ACCOUNTS

National Electrical Credit Association

Number of Accounts Reported

Division	June 1930	June 1931	Per Cent Inc. or Dec.	Six Months 1930	Six Months 1931	Per Cent Inc. or Dec.
New York	277	259	—6.5	1,926	1,619	—16.0
Middle and Southern Atlantic	135	100	—25.9	1,064	766	—28.0
New England Division	95	102	+ 7.4	799	562	—29.7
Central Division	589	487	—17.3	4,731	3,665	—22.5
Total	1,096	948	—13.5	8,520	6,612	—22.4

Total Amounts Reported

	June 1930	June 1931	Per Cent Inc. or Dec.	Six Months 1930	Six Months 1931	Per Cent Inc. or Dec.
New York	$50,015	$39,215	—23.1	$336,366	$210,004	—37.6
Middle and Southern Atlantic	15,456	19,043	+23.2	165,173	102,420	—38.0
New England	9,554	7,448	—22.0	119,820	50,788	—57.6
Central	81,795	45,477	—44.4	664,520	335,598	—49.5
Total	$156,820	$111,183	—29.1	$1,285,879	$698,810	—45.7

TRADE BRIEFS

Canadian General Electric Company, Ltd., has announced plans for the construction of a $450,000 office and commercial building on Beaver Hall Hill, Montreal.

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A new bulletin, "High-Lights on Forging," has just been issued by the Brewer-Titchener Corporation, Cortland, N. Y. The booklet is a picture story of interesting incidents in the history of forging, from its earliest beginning. Included are forgings in war and in the arts, and its influence in industrial and political development is shown.

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Synthane Corporation, Oaks, Pa., manufacturer of Synthane laminated bakelite products, has appointed J. W. Davis as its Ohio representative with offices at 1302 Ontario Street, Cleveland, Ohio.

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Dampney Company, Hyde Park, Boston, announces that William Richards has become associated with its marine department in New York.

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Square D Company of Texas has recently opened its new factory at 3111 Polk Avenue, Houston, Tex.

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F. J. McCluskey and C. F. Walter are associated with the James R. Kearney Corporation.

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Rumanian Output Trebles in Decade

RUMANIAN STATISTICS covering the electric light and power industry for 1929 have recently been made public by the Association of Electricity Works of that country. From the tabulated returns of individual operations the following totals have been compiled:

Number of establishments	155
Communities served	282
Aggregate rating, kw	162,922
Output, kw.-hr	294,747,070
Number of consumers	258,832

The output has trebled in less than a decade; in 1920 it was 95,185,000 kw.-hr.

In addition to the production by public utility plants considerable energy is generated in plants connected with industrial enterprises. The latter had an installed rating of 97,628 kw. and an output during 1929 of 201,367,258 kw.-hr.

These figures appear to cover the country's electrical industry in full; no additions are to be made for the nine electric railways serving the larger cities, since seven of these operate on central-station energy and the other two use joint plants, of which the rating and output have been included under electric light and power.

Most of the plants are small; that is, of less than 500 kw.; only three exceed 10,000 kw., the largest being at Bucharest, with 16,000 kw. Proximity of the oil fields is reflected in the general use of crude-oil engines; this type of prime mover heavily predominates in the smaller plants and forms part of the equipment in many of the larger ones; it accounts for fully 63,000,000 kw.-hr., or more than a fifth of the entire output of the electric light and power industry.

Latest available figures give the country a population of 17,393,149. Electrical saturation is therefore still very low—about one customer per 150 inhabitants, against one in five in the United States. Excluding output of industrial plants the average energy consumption in 1929 was 17 kw.-hr. per capita.

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Electrical Manufacturing Maintains Level

FLATTENING of the recent downward trend in electrical manufacturing is indicated in June returns of energy consumption in establishments of that class. Adjusted for differences in the number of working days caused by Sundays and national holidays, comparative index numbers are shown in the accompanying table.

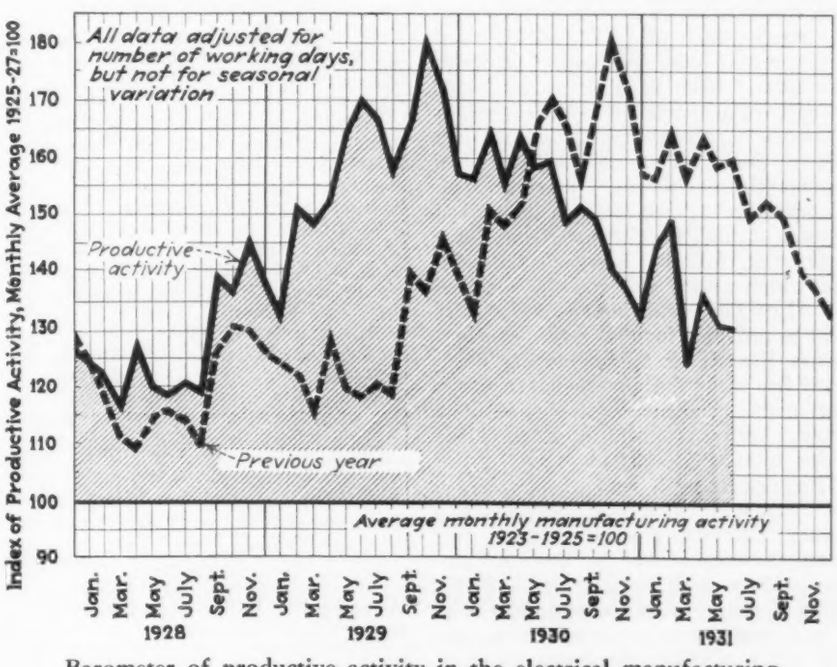
Comparative Index Numbers

Month	1931	1930
June	**130.8**	**160.2**
May	132.0	158.0
April	136.7	164.9
March	124.3	153.0
February	149.0	165.2
January	144.7	156.2
Average, six months	136.2	159.6

While there has been a decrease compared with May it has been slight, less than 1 per cent, but the level at present is 18 per cent lower than it was a year ago. It should be noted, though, that the index is still as high as it was in the winter preceding the 1929 peak and considerably higher than it was during the first eight months of 1928. The half-year average is 15 per cent lower than in June.

In contrast with those in some other regions, the New England electrical works reporting show general gains over May operations. To some extent this is true also in the Middle Atlantic States, whereas most of the returns from the Middle West are lower than in May, though the decrease is usually small.

These index numbers based on the energy used in a single industry, electrical manufacturing, should not be confused with data on the total electrical energy output in the United States, of which it constitutes perhaps 1 per cent. Fluctuations in the former may be relatively wide, and yet have a negligible effect on the much larger national totals. In fact, such fluctuations may be entirely masked by variations in the demands of other industry groups or seasonal changes in the lighting load.



Barometer of productive activity in the electrical manufacturing plants of the United States

Market Conditions

POWER company buying has slackened drastically on the Pacific Coast. Government and municipal buying, however, is filling the gap and totals are fairly well maintained. There is a decline also in railroad buying. Inquiries, however, are in better volume, indicating a probable buying revival early in the fall.

——NEW ENGLAND REPORTS SALES VOLUME WELL MAINTAINED this week in the appliance field and central-station buying is fair. Volume in the Eastern district is lower than for some time.

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EASTERN

—PROSPECTIVE ELECTRICAL ACCOUNT *seems to present more encouragement in the Eastern market than immediate business, which has eased appreciably during the past week. Central stations have entered the second half of the year with still further reduced requirements and there is little prospect in sight for any upward trend until the fall season matures.*

—THE CALL FOR *electric motors, controls and auxiliary equipment for industrial installations has reached a low ebb. Marine account, inspired by government demand, shows bright prospects for heavy orders, and forthcoming awards will assure many months of activity for machinery construction.*

Navy Department, Washington, D. C., is asking bids until September 16 for the construction of eleven torpedo boat destroyers, each of 1,500 tons displacement, with maximum speed of 35 knots per hour. Each destroyer is estimated to cost from $4,500,000 to $4,700,000, or a gross of about $50,000,000 for the entire fleet, including electrical and mechanical equipment. Electric Boat Company is making ready at its yard at Groton, Conn., for the contruction of a submarine for the Navy Department, for which award was recently received at $3,297,000, and increased facilities will be provided for the work. Westinghouse Electric & Manufacturing Company has secured a government contract for main propelling machinery in a modernization program for three battleships, totaling $1,395,632.

Supplementing a recent heavy award for watt-hour meters by metropolitan utility interests, another contract has been placed by a New York central station with a state manufacturer for additional meters to an amount of $300,000. The Elliott Company has tendered a low bid for a 400-kw. direct-current generator and 200-kw. alternating-current unit for the St. Louis municipal water works, according to a statement just issued. Westinghouse Electric & Manufacturing Company will furnish an electric-operated calculating board for system operating conditions for the Commonwealth Edison Company, totaling about $50,000. Department of Commerce, Washington, D. C., has placed contracts with a group of low bidders for supplies and equipment for the Federal Airways System, aggregating $589,135, with labor; the work includes towers, beacons, lighting of landing fields, etc., the total airway lighting contracts approximating $300,000. Packard Electric Company has been awarded a contract for a quantity of low-tension electric cable for the Philadelphia, Pa., Naval Aircraft Factory.

The Missouri-Pacific Railroad Company has placed an order with the St. Louis Car Company for two gas-electric rail motor cars.

CONSTRUCTION PROJECTS

Hilo Varnish Corporation, Brooklyn, N. Y., plans plant addition to cost over $150,000. Imperial Oil Company, Ltd., subsidiary of the Standard Oil Company of New Jersey, plans gasoline refining plant at Sarnia, Ont., to cost about $1,000,000. Magdalena Syndicate, 29 Broadway, New York, plans oil refining plant on tract of oil lands recently acquired in Germany, to cost over $3,000,000. Jamestown Iron Works, Jamestown, N. Y., plans addition to cost $60,000. Canadian Industries, Ltd., affiliated with DuPont Cellophane Company, Buffalo, N. Y., contemplates cellulose paper mill at Three Rivers, Que., to cost over $1,000,000. McKeesport, Pa., is completing plans for trade school to cost $600,000. Pottsville, Pa., plans vocational training department in high school to cost $1,000,000. Consolidated Gas, Electric Light & Power Company, Baltimore, Md., plans transformer station on Clare Street. Bureau of Yards and Docks, Navy Department, Washington, D. C., will receive bids until August 5 for one 750-kw. turbo-generator for the Portsmouth, N. H., navy yard (Specification 6544). Construction Division, Veterans' Bureau, Washington, D. C., is asking bids until August 4 for refrigerating equipment for Veterans' Hospital at Memphis, Tenn., as per specifications on file.

SOUTHWEST

—SO FAR AS CAN BE LEARNED *from the large manufacturers and jobbers there has not been the slightest indication of any change for better or worse in business conditions in the St. Louis district.*

The regular volume of orders for stock sizes of apparatus has been maintained, which seems to be normal for the midsummer. No large contracts or orders have been reported, but several are being figured.

CONSTRUCTION PROJECTS

Kansas Power Company, Topeka, Kan., is having plans drawn for a steam-operated electric power plant at Dodge City, Kan., reported to cost over $250,000. Oklahoma School for Deaf, Sulphur, Okla., has approved plans for industrial building at institution to cost close to $100,000. Arkansas Power & Light Company, Little Rock, Ark., contemplates power dam on Ouachita River, near Hot Springs, Ark., for hydro-electric power service, reported to cost over $2,000,000. Indian State Oil Company, Paris, Tex., contemplates oil refining plant to cost over $100,000. L. E. Snavely, Harlingen, Tex., plans citrus fruit packing plant at Mission, Tex., to cost $65,000. Texas Power & Light Company, Dallas, Tex., has approved construction of transmission line from Nacogdoches to Douglass, Tex., about 10 miles. Maljamar Refineries Company, Artesia, N. M., plans oil refining plant to cost about $100,000.

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MIDDLE WEST

SOME SLIGHT IMPROVEMENT *in general business is observed this week in the Middle West section. The major activities continue to maintain their positions, with a slight betterment noted in the steel industry this week. A considerable amount of steel tonnage now pending it is expected will be placed in the near future.*

—SEVERAL OF THE RAILROADS *report a record movement of commodities; in one instance carloadings exceeded a similar period last year by 3.6 per cent.*

A very encouraging indication of business improvement is contained in the seventh period report of one of the large mail order houses, indicating the best period so far in 1931 and only 1 per cent lower than a similar period last year in dollar sales. Wholesale and retail trade is holding up fairly well and more encouraging semi-annual reports are being announced. Altogether it seems that normal buying has begun to return. Some of the interesting orders placed this week include storage battery equipment complete with appurtenances to cost $7,000, construc-

tion of underground conduit lines to cost $40,000 and "Mazda" lamps valued at $125,000.

CONSTRUCTION PROJECTS

Wisconsin Rapids, Wis., plans switchboard building and equipment for municipal lighting system, to cost $50,000. Muskegon, Mich., plans installation of electric power equipment in sewage disposal and treatment plant to cost over $400,000. Mounds, Ill., has plans under way for power station in connection with extensions and improvements in waterworks, entire project to cost $130,000. Jefferson Electric Company, Chicago, Ill., has plans under way for new plant at Bellwood to cost $550,000. Taylor Disc Company, Mansfield, Ohio, plans improvements in stove and range plant to cost $85,000. State Teachers' College, Minot, N. D., will receive bids until July 30 for equipment for power plant, including turbo-generating unit, boilers and accessories. Iowa Railway & Light Corporation, Cedar Rapids, Iowa, has plans for power plant at Toledo, Iowa, reported to cost over $80,000.

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PACIFIC COAST

—POWER COMPANIES *having lately joined the industrial and railroad groups in cutting their purchases to a minimum, the electrical business has largely devolved upon government, state, municipal and, especially, contractors' needs. These have been sufficient to maintain a fair nucleus.*

—WIRING STAPLES *are moving steadily. Wire prices have dipped because of the copper base drop; schedule material prices after several years' equilibrium have decreased on certain items.*

The past week has produced a $15,000 order of General Electric oil circuit breakers for the El Cerrito changeover and a $3,000 General Electric network protector system for San Francisco and a $50,000 expenditure is reported to meet increased demands in the Redding district. State, county and municipal projects occupy an unusual proportion of building construction, including a $14,000 wiring and fixture contract for Fresno County hospital, $1,000,000 each for new gymnasiums for the Berkeley and Los Angeles branches of the University of California, 5 miles of special parkway cable for Oakland, a $500,000 live stock building for San Francisco, a $1,500,000 rebuilding and reconditioning program for California hospital and institutions, besides many small school jobs.

Motor sales last week in the Seattle and Puget Sound Field struck new low levels and apparatus movement was practically nil, with no particular indications of early improvement. Electric refrigeration business is very good and range sales are fair. Motor sales reported include ten machines from 15 hp. down to irrigation and orchard sources, one 40 hp. and six smaller machines from 25 hp. down to a lumber mill; about 35 machines from 50 hp. down to pulp and paper mills and scattered industrials, twenty machines from 25 hp. down, mostly fifteens and under, to miscellaneous sources.

City of Seattle lighting department opened bids July 24 for 150,000 lb. of weatherproof copper wire and awarded a contract for construction of two steel towers for transmission lines over Lake Washington canal, costing $13,000.

CONSTRUCTION PROJECTS

Bureau of Yards and Docks, Navy Department, Washington, D. C., will soon take bids for airplane hangar and shop to cost about $1,500,000, at Sunnyvale, Calif., where new airship base will be developed at total cost of $5,000,000. San Joaquin Light & Power Corporation, Fresno, Calif., will expend fund to $20,000,000 for steam-operated electric power plant at Herndon, Calif., consisting of four units, each to cost $5,000,000, work to be carried out over a period of months. Superior Oil Company, Huntington Beach, Calif., plans gasoline refining plant to cost $100,000. Pasadena, Calif., plans ornamental lighting system on Colorado Street. Bozeman, Mont., will soon take bids for ornamental lighting system. Logan, Utah, plans call for bids for addition to municipal power plant, including installation of Diesel engine unit. Bureau of Reclamation, Denver, Colo., will receive bids until August 17 for two direct pumping units for Wippel pumping plant, Kittitas Division, Yakima project, Wash. (Specification 524).

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SOUTHEAST

—GENERAL INDUSTRIAL ACTIVITY *in the Southeast as indicated by the energy sales to industrial plants is about 5 per cent above the low level established last year and is showing a gradual improvement.*

—SALE OF ELECTRICAL SUPPLIES *and apparatus of moderate size has maintained a fair volume, while line material, wire and cable inquiries have declined in response to the depressed copper prices and orders have been reduced to maintenance requirements.*

No large individual orders were reported. A utility company in Tennessee ordered three carloads of fiber conduit and one carload of galvanized conduit was ordered by a Georgia company. Feeder voltage regulator orders totaling about $10,000 were placed by power companies in Alabama and Georgia, and Florida and North Carolina companies ordered automatic switch houses to the amount of $9,500. In anticipation of range and water heater sales one utility company has recently ordered about $6,000 worth of meters and time switches.

CONSTRUCTION PROJECTS

Appalachian Electric Power Company, Bluefield, W. Va., has authorized construction of transmission line from Independence to Fries, Va. Eisele & Company, Nashville, Tenn., plans improvements in hospital equipment manufacturing plant to cost over $100,000. Lime Power & Telephone Company, Orangeburg, S. C., plans transmission line from Orangeburg to Raymond, S. C. Crystal Ice & Coal Company, Winston-Salem, N. C., has filed plans for cold storage and refrigerating plant to cost over $50,000. Florida Power & Light Corporation, St. Petersburg, Fla., contemplates extensions and improvements in power plant at Ocala, Fla. White Shell Corporation, Jacksonville, Fla., plans shell crushing and grinding plant to cost about $90,000.

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NEW ENGLAND

—NEW ENGLAND ELECTRICAL SALES *were maintained in steady volume during the week by a large number of moderate-sized orders. Conditions are still improving, especially in the woolen and shoe industries, and a good deal of rehabilitation work is in progress. Building and engineering contracts totaled $7,787,500 for the last reported week, against $7,567,200 for the similar week last year.*

—*A maker of electric refrigerators states that his June sales ran 28 per cent above June, 1930, in this territory. Power utility buying included a 15,000-kva., three-phase transformer, several carloads of miscellaneous underground conduit and line material in lesser volume.*

Among the orders were those for 75 12.5-hp. units, four aggregating 525 hp. and five totaling 300 hp. High-tension line material is quiet. Interior wiring is moving fairly well. Considerable job press motor and control betterment work is under way. Building projects under way include: Norfolk state prison, $100,000; Exeter, New Hampshire, town hall alterations, $20,000; two fire stations for Boston, $350,000; curtain factory at Hyde Park, $20,000; Boston Gas Company garage, $80,000; and International Harvester service station, $23,000.

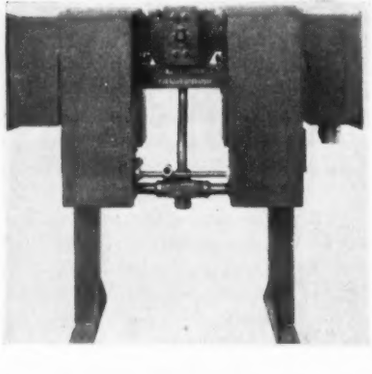
CONSTRUCTION PROJECTS

New Hampshire State Hospital, Concord, N. H., plans power plant at institution to cost about $60,000. Massachusetts National Guard, Boston, has plans for airplane hangar, with repair shop and service department, at East Boston, reported to cost over $80,000. Boston, Mass., has filed plans for a municipal printing plant to cost over $200,000. Electric Boat Company, Groton, Conn., plans new buildings and extensions and improvements at shipbuilding plant, to cost over $85,000.

New Equipment Available

Metal-Clad Switching Unit for Power Distribution

A METAL-CLAD SWITCHING UNIT for power distribution, controlling station auxiliaries, across-the-line motors or similar service where flexibility of operation, safety and minimum space requirements are desired has been announced by the Delta-Star Electric Company, Chicago, Ill. This unit consists of two 7.5-kv., 600-amp. electrically operated three-pole oil circuit breakers mounted on a steel frame and complete



with current transformers and cable compartments.

The breakers are mechanically and electrically interlocked so that both cannot be in circuit at the same time. Conveniently mounted on the front is a control panel with switches and indicating lamps. A removable handle is also provided for manual operation. The cable entrances are equipped with terminators to safeguard the cable ends and provide a ready means for sealing the cables against moisture. This gear is completely inclosed in steel and factory assembled; the only field work required is bolting to the floor and connecting the cables.

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Compact Light-Weight Pole-Top Switch

A COMPACT AND LIGHT-WEIGHT pole-top switch is announced by James R. Kearney Corporation, St. Louis, Mo. In its design the requirements for good electrical equipment have been carefully observed, it is claimed, and the results are that it is now possible to equip all lines with the proper type of gang switching equipment and still keep the construction cost within proportion. These switches are furnished in two, three and four pole units. Each pole is completely assembled so that only a minimum of installing and aligning work is necessary.

The switches are made in voltages of 7,500/12,500 Y and 15,000 and in amperages of 200 and 400. They are furnished with a complete operating mechanism less the vertical operating rod.

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AN ADDITION TO ITS LINE OF METAL-CLAD SWITCHGEAR, designated type MI-3, has been announced by the General Electric Company. This type accommodates oil circuit breakers having an interrupting capacity of 65,000 kva. at 7,500 volts and is available in normal ratings up to 1,200 amp. The units can be furnished with manual, solenoid or motor-operating mechanisms. The switchgear meets a definite need in both industrial and public utility fields. It is smaller, and yet, according to the manufacturer, it embodies the features of other General Electric metal-clad equipment—small over-all dimensions, inclosure of live parts, easy and inexpensive installation and quick withdrawal and replacement of breaker units.

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Guy Guard Covers Bolt and Strand Ends

A FULL, ROUND GUY GUARD which covers all bolt ends and strand ends with no sharp edges exposed has been announced by James R. Kearney Corporation, St. Louis, Mo. The guard provides full ventilation to the guy strand, reducing rust and corrosion from the collection of moisture to a minimum. They are easily installed with only three set screws to tighten and provide a full measure of protection to the public.

These "Lox-Round" guy guards are made of hot-dipped galvanized sheet steel. There are three clamps made of hot-dipped galvanized malleable iron which lock into place simply by sliding the halves of the guard into engagement.

There are no bolts and nuts to tighten in assembling the Kearney "Lox-Round" guy guards. The setscrews can be tightened down with an ordinary lineman's screw driver. There can be no injury to the guy strand by the set screws because of the use of a galvanized shim interposed between the setscrew and the guy strand.

650-Volt Trip-Free Air Circuit Breakers

A LINE OF ELECTRICALLY OPERATED trip-free air circuit breakers, bearing the designation type AL-1, has been announced by the General Electric Company. These units are designed for 650-volt service and are available in normal ratings up to 4,000 amp. a.c. and 10,000 amp. d.c., based on contacts not exceeding a temperature rise of 20 deg. C. They are made in single-pole or multi-pole types. Each pole is self-contained and of unit-frame construction. The multi-pole types are two or more single-pole units mechanically interconnected with instantaneous or time overcurrent trips, undervoltage trip, auxiliary switches, etc.

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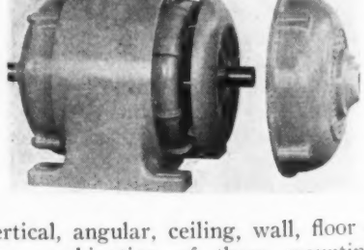
Inclosed Motor Has High Safety Factor

SEVERAL CHANGES IN THE DESIGN of the "Klosd-Tite" motor are announced by Sterling Electric Motors, Inc., Los Angeles, Calif. Although the covering protects the motor from liquids, chips, grit, etc., it is completely ventilated. A high factor of safety is built into the windings to take care of low voltage, overload, unbalanced voltages, incorrect frequency, etc. The single-fan-cooling system with the through ventilation keeps the motor cool because it eliminates the recirculation of the warm discharge air. The motor is made of cast shell type frame with the laminations securely welded into place.

The combination of the protected frame and ball bearing construction makes it possible to operate these motors in any position desired. Horizontal,



vertical, angular, ceiling, wall, floor or any combination of these mountings may be used with satisfactory operation and complete protection resulting.

The external mounting of all Sterling motors is built to the new standardized dimensions, which makes them interchangeable with all other makes and types of motors built to these same specifications.